# NATURE MAGAZINE

FEBRUARY 1924

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# NATURE CALENDAR

## FEBRUARY

"Nature's Cathedral, boundless as our wonder,
Whose quenchless lamps the sun and moon supply;
Its choir the winds and waves; its organ thunder;
Its dome the sky."

The last of the month we may hear the meadowlark, song sparrow and bluebird inaugurate the activities of the bird concert season.

The character of a bird's food, generally speaking, governs the extent of its migration. Insect-eaters journey much farther than seed-eaters.

Robins, grackles and red-winged blackbirds soon will return to northern haunts.

The great horned owl now selects a mate and they start housekeeping together.

The little gray tufted titmouse comes daily to peck at the suet hung in the apple tree.

While ice covers the surface of streams the muskrat is protected from all his enemies except the mink.

The roots of water plants form his chief diet.

The tracks left by the muskrat may be distinguished by the characteristic imprint of his feet and a continuous line made by his tail.

The woodchuck, still sleeping in his winter home, has a "lean and hungry look."

Awakened by gnawing pangs of hunger, skunks will brave the coldest weather to satisfy their cravings.

The white-foot's winter coat is a beautiful golden-fawn color with pure white under parts.

The mink is an expert and skilful hunter.

Venus is visible in the western sky during most of the month.

"What a cunning silversmith is frost! The rarest workmanship of Delhi or Genoa copies him but clumsily, as if the fingers were all thumbs. Fernwork and lacework and filigree in endless variety."

What appear to be dried leaves hanging from the branches of the cherry, lilac or ash tree, upon examination turn out to be promethea moth cocoons.

Warm sunshine will bring forth mourning cloak butterflies from the crevices and hollows of trees.

The partially grown larva of the viceroy butterfly is wintering snugly in a home made of willow leaves.

Winter buds on the maple have become enlarged and downy, foretelling the coming of spring.

The ash tree has beautiful cream-colored buds.

The graceful flowing lines of the elm tree are in beautiful relief against their winter setting.

Purple seed pods on the honey locust rattle like castanets in the winter winds.

If you live in the prevailing west wind belt, notice how much longer are the branches on the eastern side of exposed trees than on the western side.

How like a mighty whisk-broom is the sugar maple tree in winter outline!

"So high as a tree aspires to grow, so high will it find an atmosphere suited to it."—*H. D. Thoreau.*

**Prepared for Nature Magazine by the Cleveland Museum of Natural History**

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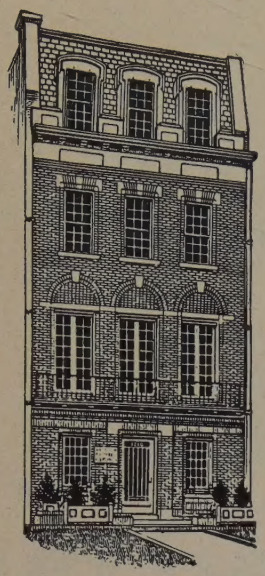

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## NATURE MAGAZINE

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FEBRUARY, 1924

Vol. 3
No. 2


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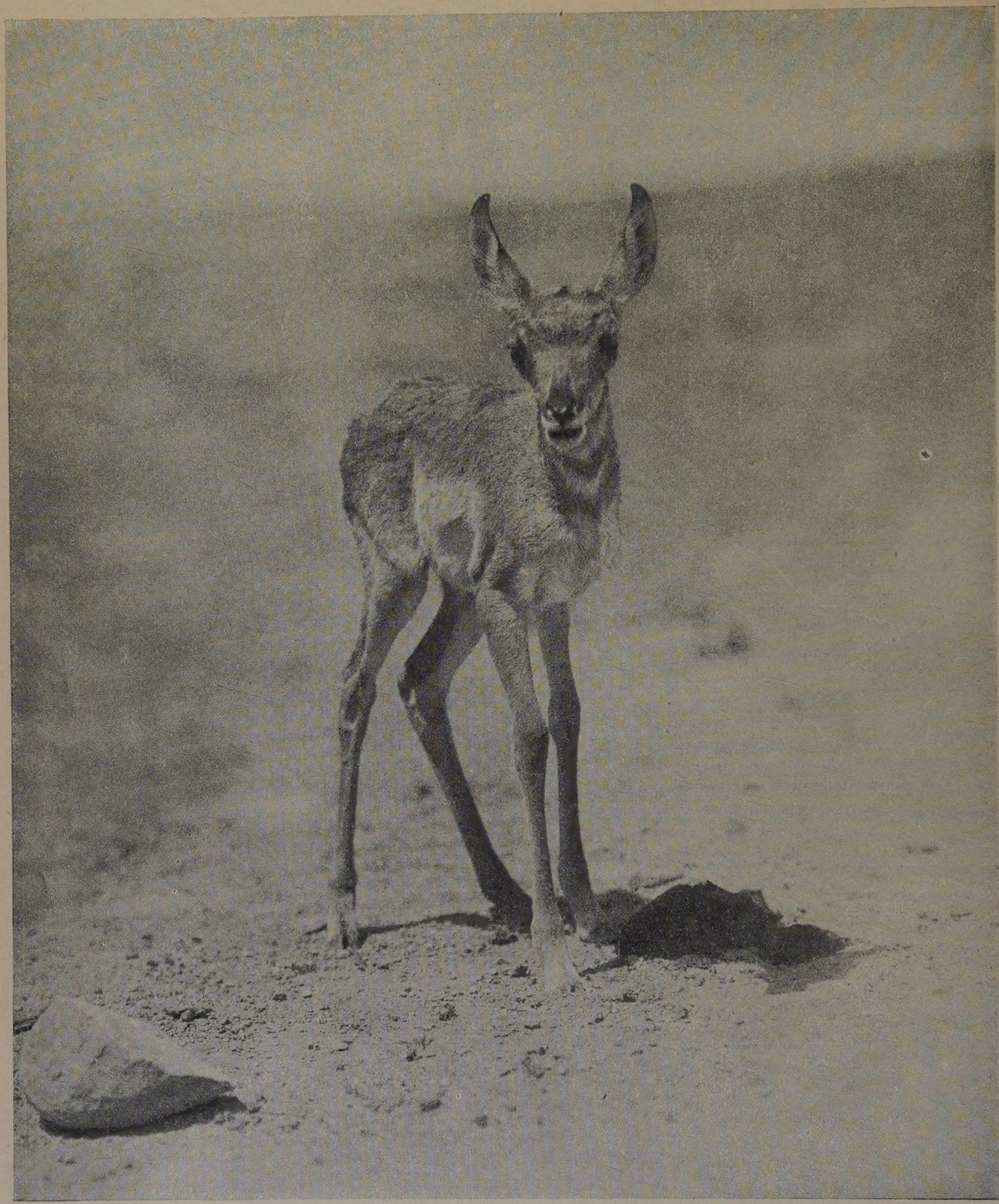


**Young Antelope** Taken in New Mexico. The antelope or prong-horn is the swiftest runner on the continent. He lives on the open plains, depending upon his eyes, his nose and his swift legs for protection. These have failed him as the country has settled up. He cannot survive wire fences and modern firearms.

NATURE MAGAZINE

Vol. III FEBRUARY, 1924 No. 2

# Can the Antelope and Sage Grouse Be Saved?

By WILLIAM L. and IRENE FINLEY

Of the National Association of Audubon Societies

(Photographs by the Authors)

THE story of the prong-horn, or American, antelope is a tragedy. For years we have been talking about the gradual disappearance and the passing of this species, hoping that something might turn up to save the dwindling herds. Today we are about ready for a funeral. It looks as if nothing could prevent the disappearance of the species unless the alarm is loud enough to ring in the ears of the people from one end of the continent to the other. Many honest efforts have been made to preserve the antelope as an unique big game species. The time has passed forever when the prong-horn can be considered a game animal. The antelope, like the buffalo, has passed the stage when it can ever be again legally hunted. With the automobile pushing through every section of the country carrying hunters with long-ranged rifles, it would be just as consistent to open a season for shooting moose and mountain sheep in Yellowstone Park.

Fifty years ago prong-horns were so abundant there was little thought of trying to estimate their herds. When antelope were numerous and widely scattered, the animal as a species was safe. It ranged over a large part of the western country from the Missouri to the Cascade Range and the Sierra Nevadas, and from Canada to Mexico. It has now dwindled to a few scattering herds in the unsettled and far distant corners of its former range. It is reaching the point of final disappearance.

The prong-horn is the swiftest animal in America. It is typical of the wide, open stretches of sand and sage. Because of its speed and its keen nose and eyes, it thrived and survived every natural enemy of the plains except man. Its coat, especially the white rump-patch, is a shining mark as far as the eye can see. The high, rocky plateaus where the antelope has taken its last stand cannot be irrigated or cultivated. We have no logical reason for dispossessing it. The antelope can never change its habits, even though pushed to a point of desperation by hunters with long-ranged rifles. Its doom is sealed unless we can give it protection from these persistent persecutors.

AN ANTELOPE FAWN

This animal, photographed in New Mexico, had been captured by some sheep herders and was being raised on a bottle.

In the very nature of things, the antelope cannot stand captivity as other species do. It does not thrive even in wide fenced areas as do the buffalo, deer and elk. It is delicate, high-strung and easily upset. Closed seasons and such protection from gunners as are offered through state game laws are of no avail. The few remaining antelope live on the waste stretches of property that belong to the

United States Government and are not in private hands. The game laws reach to these places, but they are totally ineffective because game wardens are not there. The death knell of the antelope is now being sounded in the last sage-brush barrens where the long-ranged rifle is supreme. The range cattle and sheep are tramping the bones of this unique species to dust.

THE STORY OF THE ANTELOPE IS A TRAGEDY

Here is a dried-up carcass discovered in the sage-brush of southern Oregon. There was a small round bullet hole that cut through one jaw bone and shattered the other one. The animal had likely wandered around several days before it starved to death.

There are a few hundred antelope living around the northern border of Yellowstone National Park, some in Wyoming and New Mexico. In the state of Idaho, there are about 200 in the very southwestern corner along the headwaters of the Owyhee. A conservative estimate of the total number left in California is about 300. In southern Oregon and northern Nevada, there are perhaps more than in any other part of the United States.

During 1912 and 1915, we made a study of antelope and sage grouse through southeastern Oregon. In September of 1915, we were on the high plateau south of Warner Range, in Lake County. At the time, antelope and sage grouse were frequenting an alkali sink or waterhole that was known as Jack Lake. Late one afternoon we cut sage-brush and built a blind near this watering place. The big sage-bush that suddenly grew up in an open place by Jack Lake made the animals suspicious at first. We spent four days in this blind watching, studying and taking pictures with both graflex and motion picture cameras. We entered our hiding place before daylight each morning so as to be ready when the antelope came in from the distant sage-brush plateaus. The first day we counted 142 prong-horns that came in to drink. Some of these may have been counted twice, for they came in small bands at different times. In the following days the numbers dwindled owing, perhaps, to the scent of man that lingered about the watering place. In the territory of several miles surrounding Jack Lake, we estimated there were between two and three hundred antelope ranging, and several thousand sage hens.

ANTELOPE AT JACK LAKE IN SOUTHERN OREGON

This picture was taken from a sage-brush blind where the photographers waited for four days to study these shy animals and to get a series of pictures with both graflex and motion-picture cameras.

During the fall of 1921 a report was spread broadcast that a large number of dead antelope had been found in Guano Valley, eight or ten miles southeast of Jack Lake, and about ten miles north of the Nevada line. Stanley Jewett of the Biological Survey, F. M. Brown and I. B. Hazeltine of the State Game Commission, investigated the report. Around the dry lake bed known on the map as Guano Lake, the remains of seventy-five antelope were found, five on the west side and seventy on the east side. The animals had been dead for several months and at the time were in such a state that it was impossible to determine just what might have been the cause of death.

William E. Rinehart, who owns a large ranch

A FAWN CAN BE RAISED IN CAPTIVITY

As a rule, however, its life is short. It is difficult for these delicate animals to thrive in even the large fenced areas. They need the freedom given by the open range.

in Nevada some ten or twelve miles south of Guano Lake, in company with a Nevada game warden, had investigated the matter previous to this and had seen the dead antelope. He thought the animals had been shot. Mr. Z. D. Spalding, another rancher, residing in Oregon, thirty miles northeast of the Rinehart ranch, also had made an investigation of the matter and expressed the opinion that the antelope had been killed. He told of finding thirty-nine carcasses in one place and twenty in another. J. L. Bradeen reported counting the carcasses of nineteen antelope some fifty miles to the north of this place.

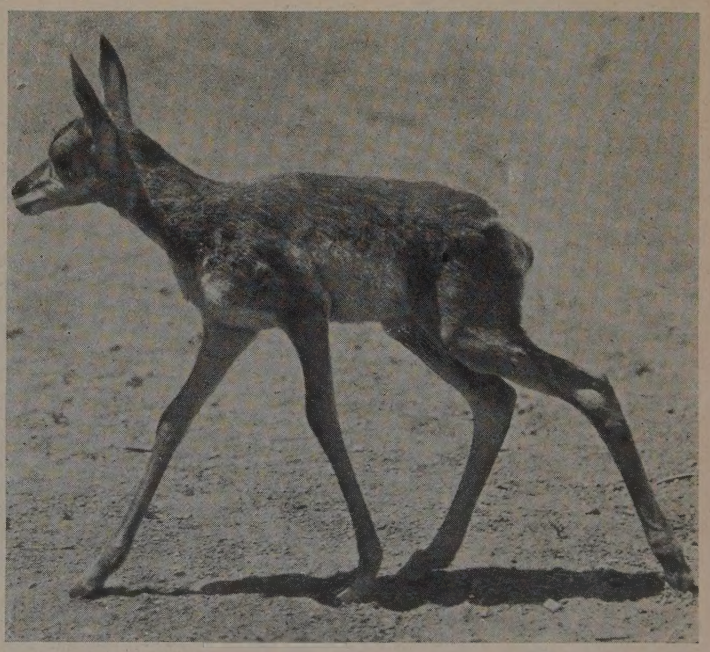
Various opinions have been expressed to the effect that the large number of antelope found in

ANTELOPE BOUNDING THROUGH THE SAGE-BRUSH

The white patches on the rump flare out when the animal is excited or scared. This is the danger signal quickly recognized by others in the herd and followed by swift flight.

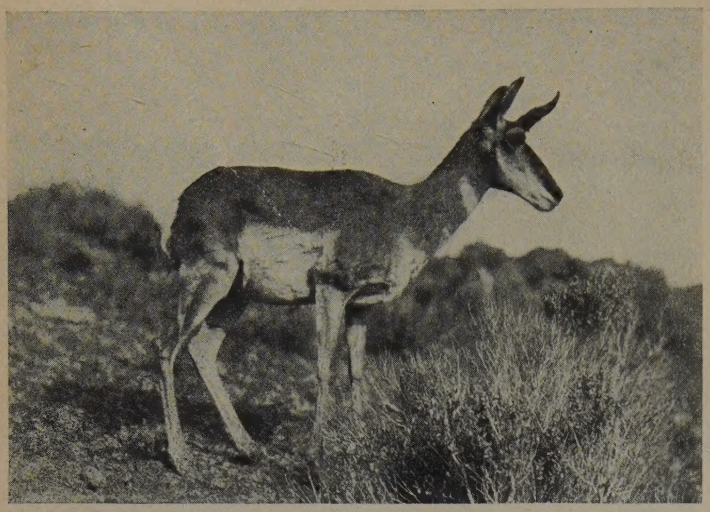
1921 may have died from disease or some poison; or that they may have starved during the winter; or that they may have been slaughtered. Regardless of how the animals died, it is beyond dispute that in one of the last retreats where the antelope are striving to hold out in advance of civilization, in a single winter a large proportion of them passed out of existence.

While in 1915 we had counted 142 antelope around Jack Lake, the investigating party of 1921



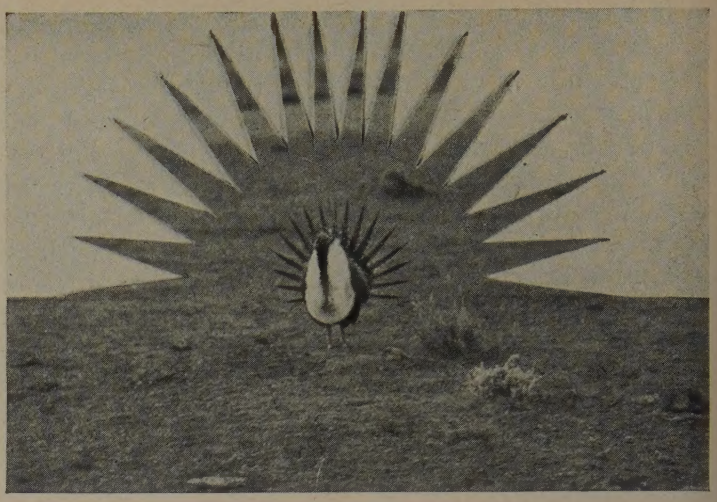
THE SWIFTEST ANIMAL IN AMERICA

The antelope often bounds away on stiff legs, but has the rebound that reminds one of a rubber ball. The animal is exceedingly delicate and is high-strung and easily upset.



HORNS HOLLOW LIKE CATTLE

But they are shed annually like the antlers of the deer. They are straight, but curved back at the tips, and each horn has a side prong which gives the animal the name of prong-horn.



SAGE GROUSE STRUTTING

The cocks go through a fantastic dance. This photograph was taken from a sage brush blind, where the birds were in the habit of coming each morning for water.

had seen but fifteen antelope in the country surrounding this place. There had been no general killing of antelope around this waterhole in 1915, yet we discovered one dried-up carcass in the sagebrush. Examining the skull, I found a round bullet hole through the jawbone. We found the skull and horns of another antelope on a rocky ridge under a pile of rocks. The skull of a third was found farther along the ridge.

Eight years ago it was difficult to get into this country. Today there is a fair road and it is easily traversed by automobile to places formerly remote. There were then thousands of sage grouse. It was the habit of the bird to come in to the watering places at daylight, and around one of these spots I estimated a little over 2000 birds one morning. I could have slaughtered a hundred with a shotgun. Today with the easy access of the automobile, with the increase of gunners and the change of conditions, there has been a tremendous decrease in the numbers of sage grouse. The birds are not wary and wild. Like the antelope, they cannot hold out against the gunner armed with his modern weapons of warfare. The most exasperating chapter in the tragic disappearance of the antelope and sage grouse is that some people are trying to lay the blame on coyotes, bobcats, ravens, eagles and other creatures that from time immemorial have lived in the rimrocks and sage of the antelope country.

The most hopeful sign, one that may result in the saving of the antelope and sage grouse in southern Oregon, is that the people of this region have at last been aroused to the wanton destruction. On November 15, 1923, a meeting was held at Lakeview, Oregon, attended by a number of ranchers who own property in and around the antelope country. At this conference a resolution was passed asking that an area some thirty miles wide and fifty miles long in Lake County, southern Oregon, be set aside by Congress as a national reservation for the protection of antelope and sage grouse. It was recommended that this be in charge of the Biological Survey and that the grazing privileges be administered as they are on the federal forests by the United States Forest Service.

SAGE GROUSE AT LAKE SIDE

This picture was taken from a blind on the shore of Jack Lake in southern Oregon, where the author estimated more than 2,000 birds.

# Wool--Nature's Protection for Man and Beast

By WALTER HUMPHREYS
**Secretary of the National Association of Wool Manufacturers**
and RICHARD W. WESTWOOD

GRAZING on the ranges of western United States, the plains of Australia and New Zealand, the fields of western Europe, the plateaus of the Argentine and the veldts of South Africa, millions of fleecy animals provide the world with one of its most important commodities—wool. They clothe and keep warm the peoples of the colder climates. They provide the means to a great industry which gives the world fabrics of excellence, and which has taxed the inventive genius of man in achieving civilized progress.

To the man discussing with his tailor, the question of whether or not he likes the herringbone weave in the material for a new suit is the major issue. When the tailor assures him that the cloth is from the finest merino wool, it generally means little more to him than that merino wool is supposed to be extremely good wool. He does not picture a twisty-horned ram, his body covered with folds of wool almost hiding his head and feet in encircling fleece, that nature has given to man. Nor does he see the many fascinating and complicated processes through which this wool has passed from the time it was sheared from the sheep until it was piled in bolts of cloth on the shelves of the tailor shop.

Undoubtedly the first use of wool to keep man warm was when one of our prehistoric ancestors threw his sheepskin garment about him and fared forth with his club to get his dinner. The industry of growing wool is, without doubt, the oldest known to the world, even antedating husbandry as an improved art. To be sure the product was used domestically for many centuries before it became a commodity for the market, and the calling of the shepherd was probably the first instance of organized industry in history.

Sheep are somewhat of a puzzle to naturalists. What race brought them from their wild roamings to serve man is not known. It is safe to say, perhaps, that they were the first of the animals to be domesticated. We know, also, that the wild sheep of today have much hair and scant wool, and the greater the cultivation the more the wool. Today we can count more than 200 different kinds of domestic sheep, and the well-versed American wool buyer knows more than 600 grades of wool.

There is a lure to the shepherd's calling. Out in the open, with the sky for a roof and the ground for a bed, he guards and watches over the hundreds in his fleecy flock. He has his sheep dog to talk to and to aid him. He strolls behind them as they patter their small feet on their way down to the water, for all the world like a waving soiled white sea. He wanders slowly among them as they graze, nubbling their noses down to the very roots

of the grass. He watches the mother love of the ewe as she calls to her lamb and the little chap comes to her from the group of his fellows.

Much of the welfare of a flock of sheep and the clip of wool they will yield depends upon the shepherd. He must keep them dry outside and wet inside. They do not demand much, but they prosper best with good forage, such as clover mixed with blue grass, growing from a clay loam.

WINTER DOESN'T BOTHER THEM

These handsome, hardy, half-wild Highland sheep with their black faces trace their ancestry to the Scotch Hills.

They prefer a dry and temperate climate, but adapt themselves quickly to a change. A rolling, broken country pleases them. Turnips and salt they love. The shepherd must protect them from the coyote and wolf, their worst enemies. His dog must be trained to be watchful but not to frighten his charges.

Within the areas of many National Forests in the west, large flocks of sheep graze in rich pastures. Their presence there is regulated by the Forest Service, which has carefully studied the needs of the sheep and advises the sheepmen. The Service urges growers to let their sheep graze openly. It warns them not to let them eat in the shade for long, because the animals eat down to the very roots of the grass and soon the ground would be only sand and gravel. The sheep must not graze too long in one spot, but in moving to richer grass they should not be driven.

If the flock is caught in a heavy rain or beleaguered in a blizzard, the health of the animals is liable to be impaired. With illness the wool of their coats is likely to be brittle and lacking in luster. Whether the wool of a sheep be close and kinky, bushy with a permanent wave, or curled with little ringlets such as girls wear in the middle of their foreheads, it will show the effect of the care he has had. If he has had clean surroundings, proper food and freedom from worry by the wild animals of the open spaces, the sheep will be true to the blood within him and produce the wool of his kind.

Sheep were known to the ancients of the days of the Bible. They provided the first textile to be used generally by Europeans for clothing. The Romans introduced wool manufacture into England, but the industry lapsed after the Saxon invasion until the arrival of William of Normandy. The fourteenth century found many woolen guilds established. Edward III, during his reign, invited many Flemish manufacturers to emigrate from Flanders, then the mecca of manufactured woolen goods.

A QUARTET OF CHEVIOTS

These clean-wooled chaps are what the tailor is talking about when he shows you a bolt of Cheviot cloth from his shelves.

This resulted in making wool, both in its raw and manufactured state, the principal source of wealth in England until the eighteenth century.

Columbus is said to have brought to the New World Spanish sheep, and it is certain that some of those explorers who followed him did bring fleecy emigrants from the Old World. To Virginia the colonists brought English sheep with wool of

medium fineness. Some of the sheep which roam the ranges today are Mayflower descendants, for Wiltshires of large size and fine wool came to Plymouth. The Dutch brought to New York long-legged sheep with coats of coarse wool, and the Swedish settlers of New Jersey came with rams and ewes to settle in the new land.

The early sheep were not the result of the breeding processes that later improved the grades of wool. They wore coarse overcoats and were leggy animals. They had to shift for themselves in the new country, which was wild and full of enemies. In colonial days they were frequently given to common herders who cared for them. Peninsulas or islands were sought out as the safest places for them to graze, and at times they were exempted from taxation to encourage the industry.

The colonists brought with them their spinning wheels and crude looms. These instruments, primitive to us today, were the cornerstones of a great industry which was to aid in the building of the new nation. The early market for the wool was, therefore, for household use, and domestic manufacture was one of the first activities fostered after agriculture. England discouraged any American industrial development, and it was not until the decade before the Revolution that the colonial authorities took steps to foster the growing of sheep and the manufacture of their wool.

At the time of the American Revolution those who had been buying British woolens stopped using them from patriotic motives. They donned homespuns, many of which were and are today remarkable for the quality of their weave. The Colonial Army fought its way to freedom in uniforms of homespun from the looms of their wives and mothers. As the war proceeded, however, some woolens were smuggled in because home manufac-

MANY POUNDS OF FIBER TO KEEP MAN WARM

Gathered flocks on the move, eating as they go. Too long grazing on one spot will reduce the surface soil to sand and dust but the careful shepherd does not hurry his charges from feeding ground to feeding ground.

ture could not keep pace with the demand. After the war the few small attempts at factories were unable to meet the British competition. Household output increased, however, and the market for wool was strong.

In the meantime in England the power loom, the spinning jenny and other textile machines were being invented and turned to manufacture. The first mill of more than one loom in America was established in Hartford, Connecticut, in 1788, and New England took its place as the wool manufacturing center of the country. Five years later, however, the foreign demand for agricultural products improved and sheep growing in the young republic fell back for a time.

CLIPPING THE FLEECE FOR THE MARKET

By hand thirty fleeces is a day's work but machine clippers can take off 300, cutting them closer.

About this time an interesting ram turned up near Boston. He was the dachshund of the sheep world, with a long body and short legs that bent the wrong way. He couldn't jump fences, which was his chief claim to popularity, and he fathered a breed known as "otter" sheep, now extinct.

The average farmer of this time was not enthusiastic about breeding to improve the common variety of sheep. This was left for philanthropists and men of means, among whom George Washington was a leader. Despite restrictions imposed in Britain he brought in rams of New Leicester blood and greatly improved his Mount Vernon flock. Attempts at sheep breeding were few, however, until between 1807 and 1815, when the "merino craze" set in.

Nibbling the grass of the valleys and plains in Spain were herds of large, long wooled fellows with folds of fleece like several double chins as waistcoats. They were carefully guarded. Only occasionally, when the King of Spain wished the favor of a foreign ruler, did some of these sheep get away from home. Austria received such a gift, and the Rambouillet breed of France is based on a flock of merinos. The Silesian merino, which produces one of the best wools, traces its ancestry to Spain. Don Pedro, the only survivor of four merino rams sent to the United States in 1801 by Dupont de Nemours, was the granddad of early sheep of his race in this country.

TEST OF A NEW METHOD

Sheep ready for a shearing with a big Gillette safety razor as a novelty compared with clipping by hand or by machine.

The Embargo Act of 1807 brought a new era in American wool growing and manufacture. Mills

MEALTIME ON THE PRAIRIE

Scattered flocks of sheep busy nibbling the grass down to its very roots. They like good forage, such as clover mixed with blue grass, and the shepherd should keep his flock dry outside and wet inside.

multiplied, but the fine wool still had to be imported. Attention was turned to improving the American herds, which totaled about seven million in 1810, and provided a part of the wool for twenty-four mills then turning out about 200,000 yards of cloth a year. William Jarvis, the American Consul at Lisbon, arranged for the importation of nearly 20,000 merinos at this time. The breed was well distributed through Ohio, Kentucky, Indiana and Illinois, with Vermont leading in the number of this flock.

The War of 1812 boomed the American wool industry. The factory system tripled in a few years. There was a falling off, however, when peace was declared and the lack of transportation facilities kept the household industry going. New breeds were brought in. British competition kept the infant industry of the new country on the jump. By 1830, however, power came to be generally applied to manufacture; household output fell off; woolen manufacture doubled; imports soared and sheep raising became a major industry in some of the eastern states. Western wool was not yet an important factor and sheep growing became the most profitable enterprise on the eastern farm. There followed, in the period up to the Civil War, a gradual shift in the sheep raising centers toward the west. The Ohio Valley was the biggest raising area. Through the Ohio and Pennsylvania canal system the wool was brought to eastern manufacture. In the forties the prices of farm products fell off, stimulating the sheep industry in the middle west. Cheaper in cost, the western clip came into active competition with the east, and the abundant range land of the west was populated with herds. Large urban centers in the east demanded farm products, becoming more interested in the local mutton supply than the local wool clip. So 1860 found three-fourths of the sheep in the west.

During the shift the people of Ohio began to pay more attention to beef cattle. Even Vermont, the early stronghold of sheep raising in the northeast, turned toward dairying. Manufacturing continued to advance; imports were large, and sheep became a minor farm enterprise, but a major industry of its own on a large scale where the distances were long.

The Civil War, of course, created a scarcity of cotton. For a time sheep raising returned to high favor in many states east of the Rockies. At the same time the world supply of wool was going forward. Prices slid back to normal by 1870, and the west regained its hold on the large scale raising. Always a frontier enterprise, sheep growing increased in Texas, New Mexico and California. There flocks were founded on a degenerate breed whose ancestors had been brought over in early days of exploration, but merinos and other better breeds were introduced. Pure Vermont merinos were found in Oregon. The raising industry became centered as at present in the Rocky Mountain

states and on the immense open spaces of Texas.

While the system of grading wool for the American market is based on an assumed proportion of merino blood in the sheep, there are many other varieties. "Blood will tell" is virtually a slogan in

Photograph by Paul Thompson

PLACID AND CONTENT

Gentle in habit when not alarmed, the sheep is one of the most contented of animals.

the sheep world and many of the first families have distinguished names, such as Romney, Welsh, Cheviots, Leicester, Lincolns, Southdowns, Shropshire and Marsh. They show their good breeding in the length and luster, curl and kink of the wool they give to mankind.

The trade in wool and woolen goods is international. As a producing nation, the United States is rated among the leaders, but it does not grow enough to meet its home demand. It exports virtually no raw wool and must import more than one-half of its supply. The sheep census gives us about 37,000,000 sheep compared with 79,000,000 for the Australasian district, and a figure slightly in excess of our own for Argentina. The world total is estimated at about 573,000,000 and the annual production of wool averages about 3,000,000,000 pounds.

In quality, the wool product of the United States compares favorably with any other part of the world. There is need, however, of greater care in the preparation of the fleeces for the market. Their appearance is generally inferior to the products of other countries, particularly Australia. Unnecessary dirt is sometimes packed in the bales and other undesirable conditions injure the prestige of our product, although cooperation with the Department of Agriculture is overcoming this.

The World War upset the trade in wool and woolens. It stimulated British and American manufacture, but its close left both overstocked with raw wool. The one great lesson of the war, however, is the importance of an abundant home supply of raw material. Yet a considerable conversion of large grazing areas into farms is now going on in the west and in Australasia and Argentine. The world production of raw wool per capita is decreasing. Hence there is a distinct economic advantage to be gained from the encouragement of more gen-

Photograph by Paul Thompson

THE BLACK SHEEP OF THE FAMILY

But still hanging around home and busy at meal time although only two weeks old.

eral use of lamb and mutton, reducing the cost of meat to the consumer and adding to the domestic supply of wool.

But we have left the herd munching quietly on the plain. We need its wool to supply the great wool manufacturing world of the United States, which has its capital cities in New England. Shearing, then, is the first episode in the career of the fleece, from the pasture to the clothes hanger in the closet. In "the old days" shearing used to be somewhat like a barn-raising, with clipping interspersed with refreshments. Thirty fleeces a day was a good day's work. With large herds, however,

a shearing machine clips off 300 fleeces and delivers them longer. As the fleece falls from the sheep it sticks together as though it were a skin. The clip is gathered up, rolled and given to the grader, who classifies each fleece according to the fineness and length of the wool.

Once arrived at the textile mill, the wool is destined to pass through a bewildering number of processes. It must be sorted first, for each fleece contains six or eight different grades of fibers suitable for various uses, according to its fineness and length. Next it must be cleaned of a fatty or greasy matter called yolk, and of all dirt or foreign matter. In the washing machine with soap and chemicals it is scoured and rinsed. The wool is then wrung out and passes to the drier, where almost all of the moisture is removed.

Arriving at the carding room, the wool is at a parting of the ways. Either it is to become woolen or worsted. In the former fabric the yarn is made of fibers crossed or tangled, in the latter the fibers lie parallel. Worsteds are made from long staple wools, and woolens generally of short staple.

The first business of the machines making worsteds is the straightening of the fibers. The operation of the carder, with cylinders and rollers covered with small wires and moving in opposite directions, commences, delivering the wool in soft strands to be wound into a card ball. The gilling machine next does its part in straightening the fibers, turning the wool over to the balling machine to be rolled up for combing. The comber finishes the job of straightening, at the same time removing the short fibers known as noils, which though pure wool, have not sufficient length for use in worsteds, but are admirably adapted for other uses. Two more gilling operations and the wool is rolled into large balls and bears the name of "finished top."

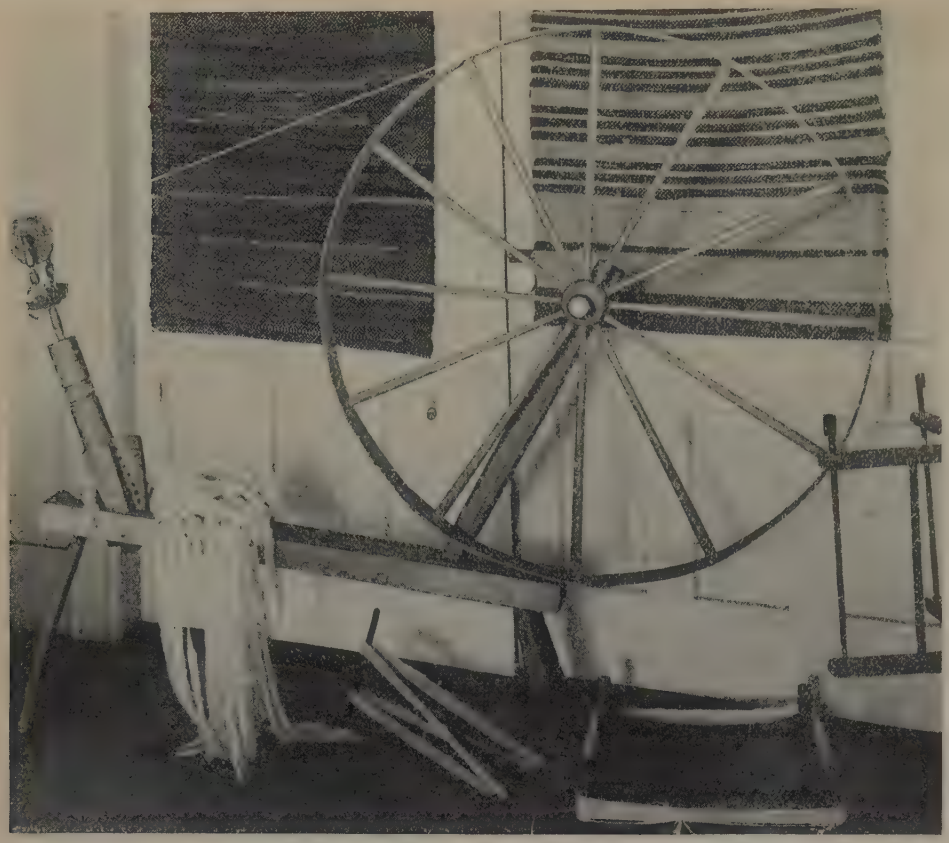
Copyright by Ewing Galloway, New York

A CHAMPION MERINO RAM OF AUSTRALIA

The amount of wool grown on this big fellow makes him a leader of all the wool producing animals, and the amount of Merino blood forms a basis for American grading.

At this point wool on its way to become worsted may make a detour to the dye house. If it is to be "dyed in the top" it gets its bath in color at this juncture, otherwise it proceeds on its way undyed.

In these early operations no twist has been given to the wool and it has no appearance of thread. It must, then, be drawn by as many as nine or more operations until it is transformed into "roving" and wound on spools. The spinning room is the next stop, where the drawing process continues and the



THE COLONISTS BROUGHT THEIR SPINNING WHEELS

This old hand spinner of fiber is the simple ancestor of a great textile industry that has done its part to make our country great.

wool is twisted into threads of suitable sizes for weaving. It is then carefully inspected and, if it is to be dyed in the skein, is wound off and makes a trip to the dye house.

The thread is now ready for weaving, and again a parting of the ways is reached. It may be used as warp, running lengthwise of the piece, or weft, running across. If elected to be warp threads, the yarn is wound on large reels and then on a large wooden roller known as the warp beam. The threads being drawn through wire heddles and a wire reed, the warp beam is completed for the loom. By what is called the "head motion," part of the threads are raised and part are lowered, allowing the shuttles to pass in and out, crossing the warp threads over the weft thread, binding the latter in place, and, incidentally, giving the patterns desired.

Now, though the wool has been converted into cloth, the end is not yet. Imperfections in weaving must be corrected, it must be cleaned and subjected to a variety of processes giving it nap and finish. If it has thus far escaped the dye house it makes its visit there.

Treatment of wool to be made into woolens differs in several essential ways. It may be dyed in the wool or wait until it is in the thread or piece. The wools or varying lengths and grades are carefully blended. The card delivers the wool in a broad flat sheet to the finisher. Still free from twist, it passes through two or three more cards and comes out in soft strands called roping. The mule spinner draws this, twists it and winds it on bobbins. The succeeding processes, differing in detail according to the fabric, are much the same as for worsteds. Many of the woolen cloths are not recognizable as they come from the looms, much of the quality of these fabrics depending upon the shrinking, napping, shearing, pressing and other

WEAVING WAS SLOW IN THE OLD DAYS

The old hand loom tediously joining warp and weft is a far cry from the immense machines that do the work in the mills of today.

Photograph by Paul Thompson

WHITE AND BLACK AT EASE

Note the different ways in which these two youngsters are lying down after rich grazing to rest. This difference, however, is not characteristic of the forms.

processes of finishing. The wonders of textile invention are fascinating. They have been refined to such a point that it is possible to utilize the reworked fiber. It is only in the woolen branch of the industry that it is practicable to use this shoddy, the reclaimed wool fiber from clips of cloth, waste threads and by-products of manufacture. While the short lengths prevent their use in worsteds where the fibers must be long and lie parallel, in the woolens these shorter lengths felt with the other new wool and consequently help to produce warm and even strong fabrics at prices impossible without this economical use of wool.

Like other of our natural resources, then, nature's gift of sheep has been turned to the use of man. It has created great industries both on the range and in the cities. It has challenged the genius of inventors and the courage of industrialists. Wool is a fabric for millions, and the industry which it has created has grown and increased through centuries until it is an essential part of our social and economic fabric.

WITHOUT NATURE'S GIFT OF SHEEP THESE WOULD NOT BE

Company houses built by the American Woolen Company at Shawsheen Village, Massachusetts, with one of the mill buildings at the end of the street where fleeces are being transformed into cloth.

# Mullein--A Naturalized American Plant

By EDITH M. PATCH

HERE in our own country, first visited by the mullein but recently, this plant is now as much at home, from Maine to California, as any native. How many of you, indeed, think of the mullein as a foreigner? Well, why should we? For we, ourselves, were all foreigners but a few generations ago, were we not—all but those who can boast of Indian blood?

The mullein has but been doing what we or our grandfathers have been doing—taking possession of a new land. In the process it has become Americanized. There is no doubt about that as you will find if you ask your cousins in England or on the continent (as the case may be) what they call that plant in their garden row, hedged to form a background of tall growth for the shorter plants in front. They will tell you, "that is the American velvet plant," using the name by which it is sold for ornamental purposes, never guessing that America is not its native home.

But centuries ago, long, long, before the mullein grew in this country, the Romans dipped its dried stalk in suet to burn for candle light in processions. Greeks soaked its leaves in oil to use as wicks in their lamps. Back in the fourteenth century, its seeds were used in Spain for stupifying fish. And there are reasons to think that this same mullein was known to the great Aristotle in the old long ago time before men began to write A. D. after the calendar year. Indeed, if you study the history of our common mullein in the years before it came to our shores, a stranger to our soil, you will find an amazing number of interesting ways in which this plant has been associated with the lives of the people of many lands. Perhaps it makes the light of the old Grecian lamps seem a bit brighter to our imagination to know that the leaves of what is now our roadside plant often served them for wicks. And it may be that the flare of the candles in the Roman processions seems more real when we know that the materials are at hand with which we could make the very same sort.

In domestic practice, mullein has also had its uses, for with respect to catarrh and dysentery, an infusion of its leaves is said to have its value, and as some country folk refer to the plant as bullock's or cow's lungwort, it doubtless has still has other uses. It has been given names such as blanket leaf, ice-leaf, hare's bean, flannel flower, feltwort, Adam's flannel, Jupiter's staff and so on. It is an interesting fact that certain observers have noted that our humming birds, sometimes collect the hairs from the leaves and use them to line their wonderful little nests.

# Oranges---Our Golden Wealth

By CHARLES WILSON

(Photographs courtesy California Fruit Growers' Exchange)

BELONGING to a distinguished family of fruit-bearing trees, the orange is an immigrant into the United States. Like many immigrants it has risen to fame and fortune. It has created an industry that partakes of the American spirit—an industry largely the product of the abilities of men who had lost health in gaining wealth and who found both in the cultivation of this golden fruit.

As it comes, fresh from the trees, the orange is the most important fruit in world commerce. The grape, as juice or jelly, wine or raisin, is more valuable. The apple is also a leading fruit, but it is grown on a large scale only in this country and Australia. The orange, however, carries its fragrance and flavor around the world, and the United States is the brightest star in this commercial firmament.

A small, long-lived tree, its branches covered with always green, oval leaves, bearing the white fragrant flowers often found in the bride's bouquet, and the yellow fruit, round or elongated, is the producer of the sweet orange, parent of the many varieties we see heaped in inviting pyramids at the fruit store. This gift of nature, with its tasty juice and acid pulp, is grown in the hot and semi-hot climates, and its market ranges to the outposts of civilization. The orange grown in regions like California and Florida, however, is better than its tropical cousins in flavor and in enduring shipment, and it outstrips them in the world's fruit markets.

GATHERING ORANGES IN A CALIFORNIA GROVE

Oranges are clipped rather than picked and great care is taken to prevent bruises or scratches to the fruit as injuries produce decay and would result in loss of fruit during the trip to market.

ONE OF THE TREES THAT CREATED AN INDUSTRY

This tree is one of the two original California navel orange trees, planted in 1873 and still producing good fruit. This tree furnished budwood for many acres of orange plantings. The two parent trees were taken to California by Mrs. Eliza C. Tibbets.

The sweet orange is a native of Eastern Asia. Moving always westward as new centers of production replaced the old, it was carried to India, Asia Minor, and the south of Europe along the Mediterranean. The early navigators of Portugal are supposed to have brought it home from India. The early development of the orange was along the borders of the great blue sea that separates Europe from Africa, and today the gray-blue hills that slope up from it are beautiful with myriad groves.

Striking out to the New World, Spanish and Portuguese explorers took the orange to Florida and the West Indies. They planted trees, found growing wild when this state later was settled, but tracing their ancestry to these explorer immigrants. They sowed the seed of a great industry, today an important factor in the wealth of California and Florida and, to a lesser extent, of the Mississippi delta and southwestern Texas and Arizona.

The sweet orange has a family tree numbering about eighty members in the United States. Many of them are peculiar and more interesting than valuable. About a score, only, have risen to a position of importance in the business world. There are several interesting relatives, however, which have more or less standing. There is the Seville orange with a sour or bitter taste, popular in the United States as a stock upon which to graft other varieties, but having further importance in England for marmalades, and elsewhere for oil and perfumery. The Bergamot orange flourishes on a small tree rarely seen in this country, and its rind makes an oil used in eau de cologne and other perfumes.

Enjoying an increasing popularity is the tangerine or kid glove orange. The King orange,

THE BEGINNING OF AN ORANGE GROVE

Orange trees are grown from hardy seeds in large lath-houses and are subsequently transplanted. This picture shows the frames in which the seeds are planted and where early development takes place.

WHERE EXTREMES OF CLIMATE ARE CLOSE NEIGHBORS

In this typical scene in southern California the snow-clad mountains look down on the luxurious growth of the orange orchards in which the fruit is nurtured in the golden sunshine of the valleys.

a native of China, with a rough skin, but pleasing and plentiful juice, is making progress in the United States. A Philippine native, the Calamondin orange, has proved a hardy citizen of the Gulf States. Satsuma, a Japanese mandarin orange, has been welcomed because it gives its natural hardiness to other varieties grafted on it. There is, also, the Otaheite orange, producing a small fruit with a strange flavor and making its chief claim to fame as a pot plant. Popular as a hardy stock we have the three-leaved, thorny bush immigrant of Japan. There are many other varieties, closely related to the parent sweet orange and differing because of climate and cultivation.

Among all the immigrants, however, the luscious navel orange is probably the leading figure. About a century ago in the village of Bahia in Brazil, a new orange appeared. The fruit was a freak, without seed. To the knowing in orange growing, however, this orange suggested much. Nevertheless it was fifty years before William Saunders, chief of the government's propagating station in Washington, got twelve of the trees producing this fruit into the country. These died, but others were reproduced, and two trees were sent to California in 1873.

Rich in romance of its settlement, California can number these trees as two of the most important individuals that ever crossed the continent. They gave birth to the entire navel orange industry of the western state. Still alive today and bearing fruit, these trees are responsible for a large percentage of the groves which cover nearly 200,000 acres of California's soil.

Florida was the early center of the orange industry of the United States. It rapidly advanced to contend at home with the fruit from the Mediterranean. Just as it was threatening invasion of the markets of Europe came the freezing winter of 1894-5. The crop failed. For the next decade it was an uphill battle to repair the loss. Confidence restored, however, the orange industry of this southern state is again on a firm basis. Louisiana's groves suffered also from the cold winter and the state has only recently come forward again.

In the meantime California jumped ahead. A citrus industry representing more than two hundred million dollars of capital and employing nearly 50,000 people was built up. Oranges are the most important figure in it. The western state came forward to supply four-fifths of the home demand for the yellow fruit and to compete in foreign markets.

The orange industry of our country is typically American from orchard to breakfast table. It has

borrowed little or nothing from the Old World. It has been built up and carried forward on a large scale by many men who were successful executives with a dash of adventure. They have produced superior oranges and devised superior methods of handling them and distributing them to the world.

ORANGE BLOSSOMS

In the neighborhood of an orange grove the air is heavily laden with the fragrance of these blossoms.

Orange growing begins with the planting of the seed, even with the seedless varieties. The seeds are carefully chosen from seedling fruit and planted in closely spaced beds. After a year the young plants graduate to the nursery, where they remain another year. They are then eligible for "budding." Buds selected from trees of proved records are grafted on these young trees, or root stocks. From this bud comes the upper structure of the orange tree. After a third year the youthful trees are transferred into the orchard, and at the age of six they are usually productive members of the orange family.

Pruning is an important part of the care of the orange orchard. It begins during the first year of the tree's life in the orchard. The trees are trimmed generally as pyramids, the lower branches sweeping the ground. The aim is to give the trees a solid wall of foliage without allowing them to become too matted with it.

Irrigation is an important feature of the orange growers' industry. It is particularly necessary in Arizona and California, while the Florida groves can generally depend upon the rainfall. The business of irrigating has been worked out carefully. It is governed by the age of the trees and the amount of rain. It is accompanied by cultivation, keeping the surface of the orchard clean and the undersoil rich.

Having reached the age of six, the orchard begins to pay dividends in yellow fruit. Age increases its output, and if properly cared for it goes on to produce for many years. The orange grower builds up an intimate acquaintance with his orchard. He has his trees indexed and knows which ones give the best fruit in quantity. He has his eye open for "boarders," and such trees are quickly taken out.

BANDAGING THE PATIENT AFTER THE OPERATION

This seedling orange tree is being budded to an orange variety of known fruit-bearing quality. The bud is inserted in a slit made in the bark of the seedling, and held in place by wrappings of waxed cloth. This is an important step in orange production.

Harvesting the orange crop is a distinct industry. In California it is often done by organized crews

GRADING ORANGES FOR SHIPMENT TO THE MARKET

The fruit passes before the expert graders on an endless belt conveyor, and is skilfully separated into various grades. Only the best fruit is shipped to the markets of the east. The grading is an exact science.

USE OF THE CLIPPERS IN GATHERING AN ORANGE

Harvesting is done with clippers and the fruit is never pulled from the tree. The clipping prevents injury to the skin of the oranges. The pickers wear white cotton gloves as a further protection to the fruit.

instead of by the grower himself. The fruit is never picked or pulled from the tree. Clippers are used and each orange is handled separately and carefully. Scratching by the limbs of the tree must be avoided. The fruits are clipped close so that no stem remains to mar the skin of other oranges, for bruises and punctures lead to decay and loss.

All the way through the handling processes care is used. The picker puts the yellow globes in a sack as he gathers them. They are carefully emptied into a box. On their way to the packing houses they are guarded from bruising and from the sun. At the packing house the oranges are cordially welcomed with a warm bath and the swish of soft brushes, followed by a cold shower. Then away to be dried by airblast and graded.

Probably not more than one-half of the crop will be able to satisfy the strict requirements of the first grade. By means of ingenious rollers the oranges are sorted into sizes, dropping gently into canvased bins. The packers handle the fruit with soft, white gloves. Wrapped in tissue paper, the oranges are packed into crates according to a definite arrangement. The parting task of nailing on covers must be careful as well.

A dropping mercury is one of the chief worries of an orange grower's life. Swooping down from the hills or in from the sea, a frost bearing wind may suddenly doom an orange crop. The trees are in danger whenever the freezing point is reached. As the mercury falls the duration of the frost makes less and less difference, and five degrees of frost will not take long to injure ripening fruit. Ten degrees spell the doom of the fruit and hurt the trees. The younger trees will likely die at less than twenty degrees. The Florida freezing went as low as fourteen degrees above zero and killed trees boasting a half century's career.

In California the growers have developed a system to combat frosts. In some large orchards the falling mercury sets off alarm bells, calling workers to the task of supplying heat from small stoves burning oil, wood, coal or charcoal. Such protection has proved profitable and practical in sections where Jack Frost is likely to make a night visit.

The orange grower has also to guard against the

(Continued on page 101)

GIVING ORANGES A BATH IN THE PACKING HOUSE

One of the first steps in preparing oranges for market is to give them a bath. For this purpose the packers employ a machine equipped with soft brushes which revolve very swiftly.

# The Moon, Our Nearest Neighbor

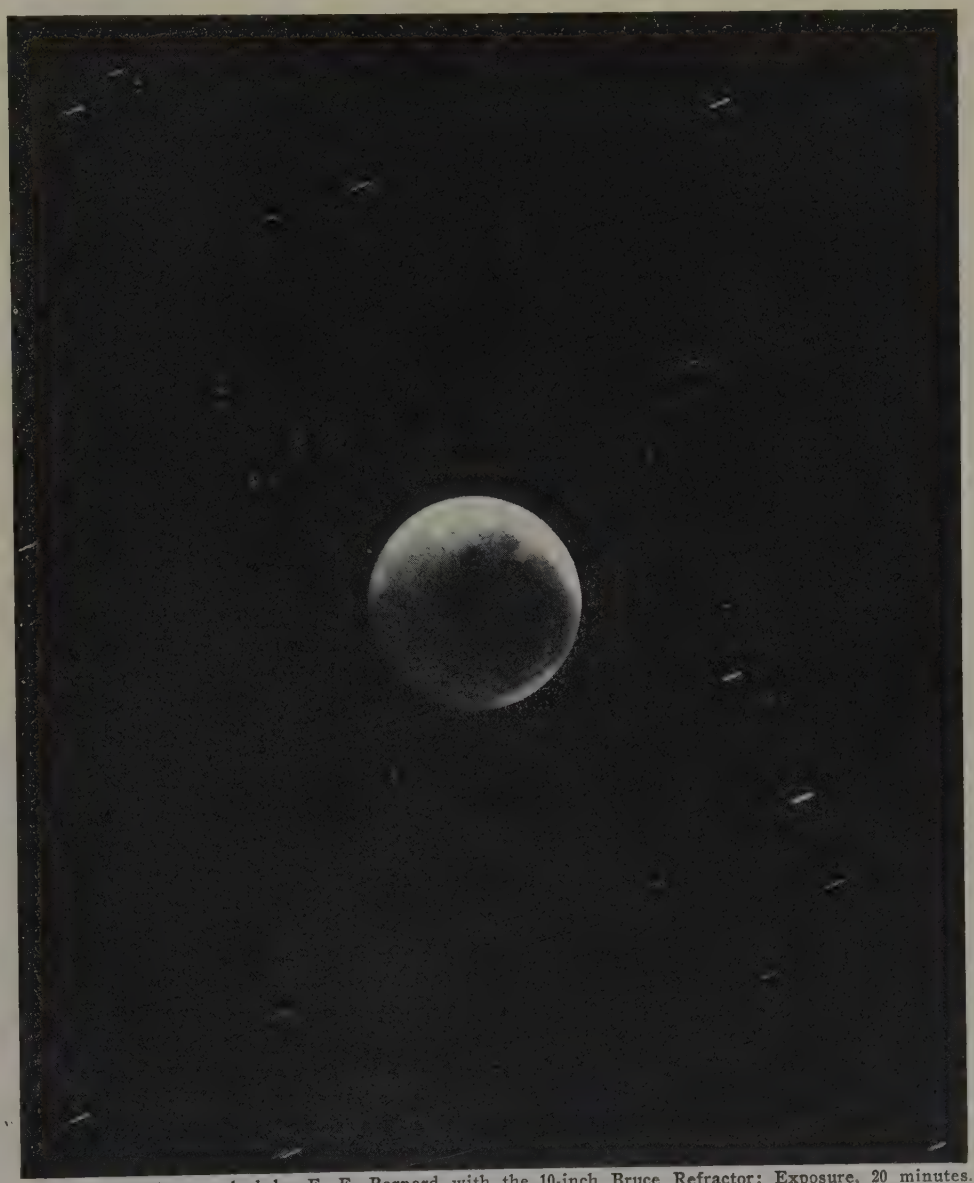
By A. H. PALMER

**Meteorologist, United States Weather Bureau**

THE moon is our nearest neighbor in space. Astronomers believe that the moon was once part of the earth. As the earth cooled from its original gaseous and molten state a small portion of its mass became detached in some manner from the parent mass, and now continues to revolve around it as a satellite. Some planets have a number of satellites. The earth has but one.

The moon is a dead body without an atmosphere. It has no water on it, either in solid, liquid or gaseous form. It emits no light of its own. Moonlight is simply reflected sunlight. The small amount of solar heat reflected by the moon to the earth is so slight that it is inappreciable to our senses. The sun rises and sets on the moon just as it does on the earth. However, the sun shines for about twenty-nine of our days on the moon, and then is below the horizon for an equal length of time before it rises again. During daylight on the moon the surface gets extremely hot; during the night it gets very cold. Because of the absence of water and an atmosphere, and also because of the great extremes of temperature to which the surface is subject, it is reasonably certain that there is no life of any kind on the moon, at least no life similar to that on the earth. We are able to see but one side of the moon, as it revolves around the earth. In other words, the same side of the moon is always turned toward the earth. If you ever seek an opportunity to view the moon through a telescope, plan to observe it when it is in the quarter phase, not at full moon. During the quarter phase the topographic features are most conspicuous, as the shadows cast by the rising or the setting sun make the irregular features stand out more distinctly than at full moon.

In observing the moon through a large telescope, certain features are readily recognized. Perhaps the most conspicuous are



Photographed by E. E. Barnard with the 10-inch Bruce Refractor; Exposure, 20 minutes.

TOTAL ECLIPSE OF THE MOON, JANUARY 7, 1917

Any lunar eclipse will be almost precisely duplicated in eighteen years, eleven days. This period is called the Saros. There are many years in which no lunar eclipse occurs, but there may be two, and even three, in one year. Each lunar eclipse is visible over more than half the earth. For this reason an eclipse of the moon, though occurring less often than an eclipse of the sun, is a much more frequent phenomenon at any given place; for a solar eclipse may be seen only along a comparatively narrow strip of the earth's surface. The straight streaks seen on the background are the trails of stars of varying brightness.

the craters, of which there are a great number. These are of various sizes and are relatively numerous in certain parts of the moon's face. They resemble one of the European battlefields during the Great War after the field had been subjected to shellfire for several days. The origin of the craters is not definitely known. However, they appear to have been caused by the bombardment of the mass by large numbers of small bodies at the time when it was still in a plastic state. Some of the craters have conspicuous hills or peaks in their centers. There are also peaks and ranges of hills or mountains apparently unrelated to the craters. In a few places there are bright spots of large size which appear as though the moon had been hit by a smaller mass which had been broken up into a powder by the impact, and the powder spattered in straight lines radiating from the point of collision. There are also large apparently level areas. These are not of homogeneous brightness, but reflect the light irregularly, indicating that there may be differences in the constitution of various parts of the moon's surface. Most of these physiographic features have been given names, and some of the names are those of distinguished astronomers of antiquity. Certain of the dark regions are called seas, though it is recognized that there is no water on the moon at the present time. There is no conclusive evidence that there has been any change of a single visible feature of the moon's surface since man first began to study it with the aid of high-power lenses.

THE CAUCASUS AND APENNINE MOUNTAINS

This is an enlarged detail, from the eighteen-day moon, of the two mountain ranges, which nearly separate Mare Serenitatis from Mare Imbrium (on the right). The upper range has been named the Apennines, and the lower the Caucasus. Mountains on the moon are relatively higher than on the earth and are much steeper, due to the pull of gravity on the moon, which is only about one-fifth of that of the earth.

Besides giving us moonlight, Luna exerts recognized influences upon the earth. It is the cause of the tides of the ocean, which result from its gravitational pull upon the liquid mass of water. But it ex-

Photographed by Frederick Slocum with the 40-inch Refractor.

THE MOON, AT AGE SIXTEEN DAYS

This is a little past full moon. All the so-called seas are well shown. The "seas" are invariably lower than the surrounding surface; some are lower than others. They are darker, and sometimes there are traces of yellow and green tints; other portions are described as dusky green, light green, golden-brown yellow, very decided sepia. This may be due to vegetation, or may be due to large areas of colored volcanic material. Few astronomers now believe that these "sea bottoms" were actually such. The evidence of erosion by water is very small.

erts a gravitational pull upon the solid earth as well. However, because of its rigidity, the earth tides are not so evident, and can be detected only with the aid of delicate scientific instruments. The tidal effect upon the atmosphere is also inappreciable to the senses of the human race.

Ancient almanacs to the contrary notwithstanding, the moon does not have any appreciable effect upon the weather. In the last analysis practically all of our weather changes result from solar heat. The reflected solar heat received from the moon is so slight that its influence is insignificant. There

Photographed by R. J. Wallace with the 12-inch Refractor

THE MOON, AT AGE FIVE DAYS

A new circular "sea," Mare Nectaris, has appeared, and between it and Mare Crisium is Mare Foecunditatis. Note the horseshoe-shaped bay in Mare Nectaris, Fracastorius. Careful scrutiny shows a few remains of its northern wall, the greater part having been dissolved by a re-melting of the surface. The famous crater, Theophilus, is seen partly outlined on the northeast edge of Mare Nectaris. Equally well-known is the small round crater, Madler, west of Theophilus.

may still be a few backwoods farmers who plant and harvest "according to the moon," but modern scientific agriculture has demonstrated the futility of their reasoning. Soothsayers and clairvoyants still observe the moon and the planets in plying their trade among the credulous, the uninformed and the unsophisticated. Modern psychology has disproved any such influence upon human affairs. Soothsayers and clairvoyants prosper inversely as the rate at which human intelligence spreads. Weather predictions based upon the changes of the moon's phase are worse than useless, for they tend to keep alive an ancient and abandoned superstition.

An eclipse of the sun occurs when the moon gets in the line of sight between the earth and sun. An eclipse of the moon occurs when the earth gets in between the sun and the moon, thus cutting off the source of light received by the latter. During an eclipse of the moon it can usually be seen as a reddish brown or bronze ball. This is not light of its own, but is sunlight which has been transmitted through the atmosphere of the earth to the moon and then reflected back to the earth again. This moonshine is really earthshine which in the last analysis is sunshine.

During a total eclipse of the sun certain features on the sun's edge can be observed to better advantage than at any other time, as the moon cuts off temporarily the intense sunshine of the sun's face, which astronomers term the photosphere. Among these features are certain gaseous flames which shoot out from the sun in all directions, perhaps hundreds of thousands of miles from the central mass of the sun. Astronomers call these prominences. Because of the opportunity for observing

Photographed by R. J. Wallace with the 12-inch Refractor

THE MOON, AT AGE TWELVE AND ONE-HALF DAYS

Imbrium and Mare Nubium are fully revealed, with the round Mare Humorum added. The latter is of the size of New York State. The huge crater, Clavius, at the extreme south, is now barely discernible. Directly north of it Tycho is still prominent and its ray-system is for the first time conspicuous. One ray can be traced to the west until it overlies Mare Nectaris. Tycho is not quite the center of these rays. Rainbow Bay is a noticeable addition to Mare Imbrium; to the left of it is the round walled-plain, Plato. The fine walled-plain, Gassendi, on the northern edge of Mare Humorum, must not be overlooked, with its floor 2,000 feet above Mare Humorum. It is unrivaled for the variety of its details, and, after Plato, has perhaps received more attention from observers than any other object. The mountains ranging southeast from it are the Percy Mountains. Despite the apparent brightness of the moon it sends to the earth less light and heat in a year than does the sun in thirteen seconds.

these peculiar features of the sun scientists sometimes journey thousands of miles in order to secure photographs during the brief interval of totality. Regions of the earth where the sun is in total eclipse are small, and are well defined for each eclipse.

Lick Observatory, on the summit of Mount Hamilton, about fifty miles south of San Francisco, California, is maintained as a part of the University of California. On the summit of Mount Wilson, near Pasadena, California, the Carnegie Institution of Washington has erected an astronomical observatory in which may be seen the largest telescope in the world. Many photographs of the moon have been made at these observatories. The facts here presented are brief statements of a few of the many wonderful facts which have been revealed by the researches at these important institutions.

Photographed by G. W. Ritchey with the 40-inch Refractor.

THE MOON, AT AGE EIGHTEEN AND ONE-HALF DAYS

This is an excellent phase to compare with the seven-day moon, as a broad zone near the terminators is common to both and the craters and other details are seen under morning and afternoon sun, with shadows, consequently, on opposite sides of the formation. Theophilus, inconspicuous at seven days because of its distance from the terminator, is here shown at its best. Mare Imbrium is prominent near the bottom, connected to Mare Serenitatis by a "strait" between the Caucasus and the Apennine Mountains. On its lower edge is seen the walled plain Plato and semi-circular Rainbow Bay. Above it Copernicus and Kepler, with their ray systems, are conspicuous, and at its eastern edge, the crater, Aristarchus, the brightest object on the moon. Above Copernicus is the broad expanse of Mare Nubium, reaching almost to Tycho, whose ray system is here well shown. These rays are longer and their direction is more definite than those surrounding Copernicus. A possible explanation of them is that they are the results of cracks due to pressure from within. Another theory supposes a wind blowing uniformly from the crater which deposits pumice powder and the like in streaks. If impact of a huge meteor may cause a crater, it might also produce the cracks. To the left of the center can be seen many narrow rills—small cracks in the surface, a mile or two wide. Look closely for the "railroad" or Straight Wall, in the upper left-hand corner of Mare Nubium. It is a cliff about 500 feet in height, a geologic "fault."

# Preparing Insects for the Camera

By J. G. PRATT

**Scientific Photographer**

FOR a number of years the writer has spent considerable time in preparing the illustrations of insects, and perhaps departments of various colleges, individual collectors and amateur photographers may be interested in the numerous methods employed in getting these tiny subjects to pose properly for the person with a camera.

Most students know the treatment of butterflies and moths, killing them in a cyanid jar and drying out the wings on a spreading board, and so this work has generally been left to others. Figure 1 shows the gypsy moth so mounted, and photographed in a form that is somewhat enlarged.

Figure 1. The gypsy moth (Porthetria dispar Linn.)

Figure 2. The Colorado potato beetle (Leptinotarsa decemlineata Say.) Enlarged several times.

The greatest difficulty is experienced with those insects which contract at death, leaving a shapeless mass of legs and antennae. Beetles generally are best killed by dropping them into boiling water for a few seconds and then stretching them out on a sheet of cork with insect pins. Let's take the common potato beetle as an example and get to work at this interesting type of photography.

The hot immersion kills him instantly, and you notice that the legs are contracted, though limp, and the head indrawn, leaving only the shape of a turtle's back. First, run an insect pin perpendicularly through a small sheet of cork, and then thrust the point through the abdomen, being careful that it does not puncture the back. Take a sharp dissecting knife and sever the bony tissue of the throat to facilitate the drawing out of the head. Now draw the beetle down toward the cork until the feet will just touch when in the proper position, and fasten a small upright section of cork about half an inch to one side, so that pins can be inserted horizontally where needed as well as vertically. A few pins underneath will keep the beetle at the proper height, and some across the back will prevent its being raised up when pinning out the head. This latter can best be done by a slanting pin run up through from underneath. In some beetles with very small antennae, a bit of cork should be placed just under the head so that this may be more readily pinned into position.

Now pin out the legs, using lots of pins and then lots more—on both sides and at each segment, and two or three to each antenna. When finally in as life-like form as possible, lay the work aside

Figure 3. The Achemon sphinx (Pholus achemon Drury.)

for a week or so to dry out thoroughly before removing the pins for photographing or placing in the permanent collection. The beetle in Figure 2 was photographed considerably enlarged, using a K-3 color screen and a panchromatic plate in order to record properly the black and orange markings.

Ordinary caterpillars and worms can often be taken natural size while alive, by administering a spray of ether to quiet them during the short exposure required. Figure 3 is the large Achemon sphinx commonly seen on the grape vines, and Figure 4 shows the fall webworm just as it was found on a geranium leaf.

Not so, however, with the tiny variety which must be highly magnified, requiring a long exposure, especially alcoholic specimens which slowly shrink when out of the alcohol. If it is found that movement occurs from shrinkage the only alternative is to photograph the object in some liquid, preferably boiled water, which is free from bubbles. The plume moth larva seen in Figure 5, just one-quarter of an inch in length, and pink and white in color, was photographed direct at twelve diameters by employing the following method:

A piece of modeling clay or plasticine was rolled into a string about one-eighth of an inch in thickness, and made into a one-half inch ring. This was flattened down on a clean microscopic slide until just the thickness of the larva. It was then filled with water, the larva inserted, and one of the thin cover-glasses pressed tightly down on top, with care to see that the larva was somewhere near the center. This compartment will remain air- and water-tight for a considerable length of time, the specimen will not shrink; and, since it is wedged in between the two glasses, it will remain perfectly still, however long the exposure required. These slide cover-glasses are so thin that they register little or no distortion. It should be remarked in this connection, however, that in photographing larger specimens in liquid a cover should be used of optically corrected glass. Soft-bodied insects, such as aphides, which are so prevalent in the spring, can be practically stopped in their tracks by placing them in a tight receptacle for a few minutes with a tuft of cotton saturated with a weak solution of cyanid. Figure 6 shows one of the common plant lice highly magnified. Figure 7 is the corn borer, somewhat enlarged, just as it appeared in an ear of corn after fumigation with carbon disulphid.

Figure 4. The fall webworm (Hyphantria cunea Drury.)

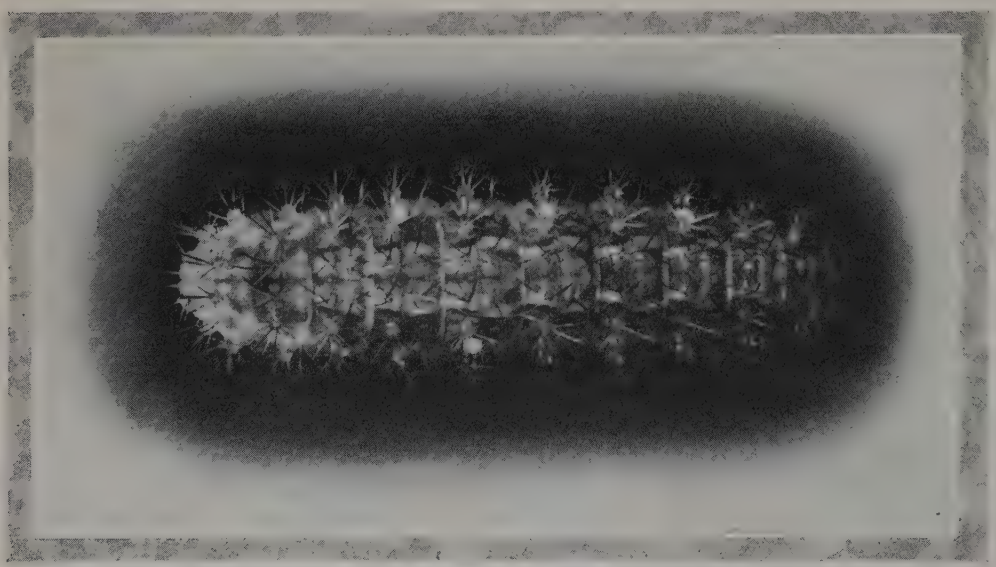


Figure 5. The plume moth larva (Pterophorus monodactylus Linn.)

Little effort has ever been directed in the entomological world toward photographing minute beetles in anything approaching life-like form, due evidently to the fact that they are too small to be spread in the usual manner, and illustra-

tions of the grain weevils, little snout beetles and myriads of other tiny forms, have heretofore, of necessity, been prepared by the artist.

A short while ago a half dozen live beetles, measuring about four millimeters in length, were received by the writer with an order for a "close-up" of the insect in the wood which it was injuring, and to be in as life-like form as possible. Wowie! The first one was cyanided, but his snout curled under and the legs came off in the process of straightening out under a binocular. The second was dropped into boiling water, but without success, and when all the tricks of the trade had been tried and but one whole specimen remained, the situation became serious.

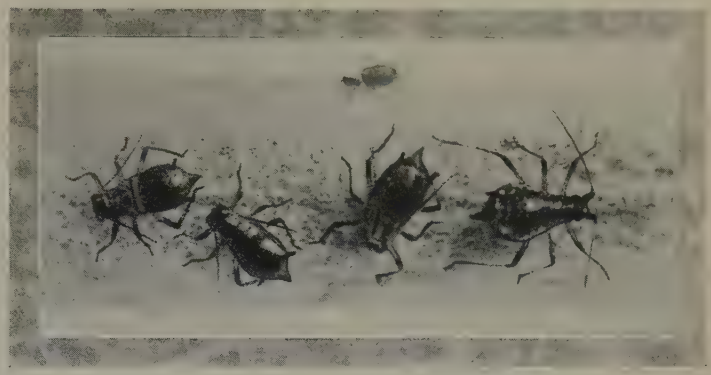


Figure 6. The chrysanthemum aphis (Rhopalosiphum rufomaculata Wils.)

Figure 7. The European corn borer (Pyrausta nubilalis.)

It was remembered that N. A. Cobb spent years in photographing the housefly, and finally succeeded in injecting into the thoracic ganglia the sting of a mud wasp, which left it alive but unable to move. But no mud wasps were available, and besides, it would have been about like trying to shoot a squirrel in the eye with a thirteen-inch gun. One live specimen and a reputation at stake. As I glanced around the laboratory a package of modeling clay arrested my attention and seemed to offer a ray of hope for solving the difficult problem. A piece, worked over a bunsen burner until soft and pliable, was flattened out on an old negative glass. Another piece was held over the burner to keep it soft, and the vial containing the insect was turned upside down on the flattened clay. When the little fellow stopped playing "possum" and started to crawl, up came the vial and down came the soft clay on top of him. The next day the beetle was dug out and photographed just as seen in Figure 8. The snout and antennae are in perfect position and the legs on one side are fairly well defined against the light background.

This method has since proved very successful, and has been improved by pinning out the insect under a binocular, using one-half inch headless pins and a pair of forceps, in order that it may dry thoroughly in exactly the position in which it died in the clay. Although the process consumes considerable time and is rather tedious, if one must have good photographs it is well worth the trouble. Figure 9 shows the weevil often seen in flour, prepared in the above manner and photographed up to nine diameters; and you will notice that the entire position

Figure 8. The cosmos weevil (Baris confinis.)

Figure 9. The confused flour beetle (Tribolium confusum Drury.)

Figure 10. The Three-Lined Potato Beetle (Lema trilineata Ol.)

Figure 11. The orange garden spider (Epeira diadema)

is practically that which is assumed by the insect when it is in the act of crawling.

Photographing most insects alive is largely a matter of chance, as they just won't stay still long enough, and the short exposure necessary on this account is rarely sufficient to give the proper definition. The beetle seen in Figure 10, which is considerably enlarged, was taken into the laboratory, and, after several attempts, was coaxed into remaining still for ten seconds.

The writer had a little joke in connection with this photograph, as he submitted it to an eminent authority on entomology for criticism as to the accuracy with which the insect had been "mounted." The "eminent authority" said that it was only fair; that the legs were not symmetrical; the antennae should be more to the front; and that it looked generally as if it were in the act of crawling. When informed that such was the case he looked rather sheepish. Figure 11 is the large black and yellow spider commonly seen in the blackberry patch, which had spun his web alongside the inviting wall of the greenhouse.

Photographing insects is often a rather difficult task, as no two take the same treatment, and one must follow up various lines of experiment in order to obtain the best results; but the subjects are unlimited, and the gorgeous color schemes with which nature has decorated these tiny denizens of the field and garden, make each one of them an interesting and useful theme for the photographer who is interested in studies from life.

DIVIDENDS PAID BY THIS WOODLOT

Stand of timber on a farm near Keene, New Hampshire, which was planted in 1873 and sold for $1,000 in 1902 and is now making more money—an object lesson in the value of timber raising.

# Forestry via the Pocketbook

By RICHARD W. WESTWOOD

"FARMER, grow some trees!"

This is good advice. It is the kind of advice you might expect to hear from a member of a forestry association. It might be given by a professional forester. It might come from a neighboring farmer who was sensibly and scientifically turning green trees into greenbacks every year from his prosperous farm woodlot. You probably would not expect it from a bank, but that is where it comes from.

A few years ago our government established the Federal Land Bank. It divided the country up into districts. In each district it placed a bank to extend long-term loans to farmers, so they could build up and develop their agricultural property. The New England states, New York and New Jersey were called District Number One, and the bank was established at Springfield, Massachusetts. Ever since, in a quiet way, this bank has been doing a mighty important bit of work in the encouragement of forestry and the growing of timber.

In the northeastern states there is much good farm land. It can and does produce valuable crops when constructively and intensively tilled. This takes time and money, and that is what the bank is there for. On much of this acreage timber is growing. On a lot more of it—land that will not fatten a cow or grow a cabbage—timber should be growing. The truth calls for strong emphasis.

The Land Bank at Springfield happens to have as its president, Edward H. Thomson, and on its staff, E. D. Strait. Both of these gentlemen know that land growing trees is more valuable than land growing nothing. They know that if it continues to grow trees it can keep right on being worth something, and that if it goes on growing nothing—well, it will just go on being worth nothing, even less than nothing. They know this because they both have their own little forests, one in New Hampshire and the other in New York state.

If you have followed the plot thus far you have an inkling of what the dialogue is going to be in the next scene when James K. Farmer comes in to talk about a loan. He is going to be asked how much timber he has grown on his farm. The bank is going to inquire how he has been cutting it out, whether he has been reforesting and other details about his stand of trees.

In the next scene the bank's appraisers are going to visit the farm, and while they are taking account of stock they are going to pay considerable attention to the woodlot. They are going to find its existing value. They are going to talk with Mr. Farmer about how to handle his timber resources—what to cut and what not to cut, and when—and how to administer it next year, and the year after and years after that, so that the woodlot will be paying its rent and a bonus besides. In their recommendations to the bank the appraisers are going to take this all into consideration, and the bank is going to give it close study. So if Mr. Farmer has been practicing good sense with his woodlot, and

WHERE A WOODLOT WAS AND SHOULD BE

Eroded hillside on New England farm where lonely trees remain as reminders of the once valuable stand of timber. The failure to reproduce the woodland growth has resulted in this condition of serious waste.

intends to go practicing it, the loan will be treated accordingly.

Up to November 1, 1923, the bank at Springfield has made 9922 loans, involving $30,438,385. On ninety per cent of the farm properties concerned there is a growth of timber. In making seventy-five per cent of these loans the stand of timber played an important part. The loans of the bank are for long terms, running between twenty and thirty-four years. Growing timber as a crop is a long-term proposition. The bank figures, therefore, that nothing would so safeguard its loan as systematic growing of timber.

With the closing of each loan the farmer re-

USING PRODUCTS OF FARM WOODLOTS

Barrel-making plant which draws upon the forest resources of farmers for its supply of wood, giving the community the benefit of industrial activity resulting from the growth of timber.

ceives a statement from the bank on the care of the woodlot. This declares that "our observation leads us to believe that the woodlot is the most abused portion of the average farm in this district. In these days of fast diminishing timber supply proper care and management of the woodlot means much, not only to the farmer himself but to the country at large."

The bank also gives the farmer advice on the best methods and procedure in cutting. It suggests that he use the poorer or dying growths for firewood, at the same time aiding the growth of the more valuable species. It instructs him how to prevent the spread of white pine blister rust by the removal of currant and gooseberry bushes. It urges protection from the devastation of fire and advocates taking advantage of any laws permitting deferred taxation of growing timber lands. In the case of both the blister rust and fire hazard, the bank warns that the security value of the woodlot is diminished by such dangers.

Whenever Mr. Farmer wants to make a cut in his forest area, he applies for permission from the bank. His application specifies what he wants to cut out. It states how long it will take him, whether he is to use the timber or sell it, who is going to log it and other details regarding the kinds of trees, their age and something of their history. The bank considers this application from the point of view of present wisdom and the future good of the woodlot. If it grants permission, a payment of an instalment on the loan is generally requested.

"Growing a good crop of timber requires knowledge and skill just as does the production of a good farm crop," the bank tells Mr. Farmer. "You cannot produce the latter without care and effort. It is equally absurd to expect that a woodlot can be maintained in excellent condition without careful attention to details."

This is forestry via the pocketbook. It is constructive. It is an attack on the destruction of timber resources in a section suffering heavily from the results of prodigal exploitation in the past. It is a reflection of the bank's conviction that the wood timber resources of the average farm are not fully appreciated, and that, except in rare cases, they are not fully developed.

Perhaps one of the most significant statements is made—a statement in which is packed a wealth of forestry wisdom—when the bank says to Mr. Farmer, and to anyone else who thinks of the pocketbook side of growing trees:

"We believe that in many instances the growing wood and timber, if properly handled, will, over this period of years prove not only a great help in meeting the regular instalments, *but in time may so develop as to pay off your loan in full.*"

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## Oranges---Our Golden Wealth

(Continued from page 88)

marauding of various insects and diseases. "Foot rot" is a troublesome ailment attacking the tree root and generally killing the growth. The orange dog, saddleback caterpillar, bagworm, cotton stainer and leaf-footed bug are pests with interesting names but expensive habits of tunnelling into the yellow fruit. The most dreaded insect class is the scale group, however. The white scale was for a long time serious until the ladybird beetle was introduced as the natural enemy of the scale and won a noble fight. Other scales are also troublesome and the whole group of orange enemies must be met by various aids and processes of fumigation.

In California the seedless Washington navel orange is the leading citizen in the citrus community. It is a winter orange with a shipping season extending from December to May. For the summer California has the Valencia, immigrant from the Azores and developed carefully. It is paler than the rich, golden navel and frequently occurs with no seeds and generally with few. There are other varieties grown and shipped in small quantities, including St. Michaels, Mediterranean sweets and blood oranges.

Florida's orange crop is being produced under conditions of increasing development. It has a market season, however, which coincides with the West Indian output and the Mexican crop, to which increasing attention has been given. The protective tariff builds a strong wall of defense for the whole orange crop of the United States.

Future development, it is expected, will bring forth new orange species. But as it now stands today, the orange industry of the United States is a strong American institution. With tools of genius and courage it has taken the material given by nature to make golden wealth of the yellow fruit that we Americans like as a start to our day.

# Trees Along Western Highways

By WILLIAM L. and IRENE FINLEY

Of the National Association of Audubon Societies

BORDERING the highway along the coast of Oregon not far south from the mouth of the Columbia River, between Seaside and Cannon Beach, was a fine stretch of virgin forest. Majestic old hemlocks and spruces six to eight feet through at the base were bedded in a lower growth of vine-maples, alders and ferns. This picturesque stretch of road was known far and wide. The property bordering the highway, and the timber, belonged to the Crown-Willamette Paper Company. The tall trees were their stock in trade. When the price of paper advanced a few years ago, the ax, the cross-cut saw and the donkey-engine began an advance along the highway. The woods thundered with the falling giants and the donkey-engine screeched and whistled. The print upon the very paper they had made carried to the people a story of the annihilation of this beauty spot. The value of public opinion soon overtopped the high price of pulp. The big corporation had a legal right to go on with the cutting, but they stopped operations because the virgin forest bordering the highway was really worth more as scenery than as pulp. Since then the paper company has been reforesting this area with scientific persistence.

While only the stumps of big trees remain for nearly a mile to tell the story of destruction along the coast highway, yet from the top of the long hill going down to the mouth of Elk Creek at Cannon Beach, the timber still stands; and many other stretches of picturesque trees along Oregon highways have been saved as the result of a little publicity properly applied.

Following this publicity, the Scenic Preservation Association of Oregon was formed with a plan of organizing in each county a branch to handle local problems, and all counties working through the state organization. This move was started by the Portland Kiwanis Club.

Judge Robert Sawyer of Deschutes County, cooperating with the Oregon State Highway Commission, induced the Brooks-Scanlon Lumber Company to reserve a strip of standing timber along each side of the main central Oregon highway ten miles south of Bend. Up to this point a fine stand of yellow pine timber had been logged off, leaving a desolate area exceedingly dry and uninteresting. The United States Forest Service assured the lumber company that if the remaining timber along the highway were left standing, and if exchange authority could be received from Congress, it would enter into negotiations whereby a strip of land 300 feet wide on each side of the highway near Lava Butte would be exchanged for timber of equal value in

DESOLATION SHOCKS THE TRAVELER

Lower Columbia Highway near Rainier where the forest has been completely cut along the road. This is a state of affairs which is meeting with active discouragement as a result of organized effort.

ALL THESE TREES ARE GONE

Highway between Seaside and Cannon Beach on the coast of Oregon as it appeared before the trees were cut.

A DELIGHT TO MOTORISTS

Pacific Highway, near Grant's Pass, Southern Oregon—a stretch of roadway which attracts tourists.

some other place. The recently enacted exchange law is now in effect and a fine stand of big yellow pine trees along the main highway has been saved.

A little publicity along these lines has shown itself in a variety of ways. In the vicinity of some cities and towns in Oregon, systematic efforts in tree planting have been inaugurated along the highways. A good example of this is near The Dalles, where the Kiwanis Club has taken the initiative and planted about two miles of trees just approaching the city. The Oregon State Highway Commission has planned to plant trees in an experimental way along the Columbia River Highway in northern Morrow and Umatilla Counties, which will, perhaps, correct the drifting sand in places and make this section of the road much more attractive to the traveling public.

Some counties in Oregon have taken up the wanton trimming and destruction of trees along the highways by public utilities. In the construction and maintenance of power, telephone and telegraph lines, the attitude of these corporations has become much more careful as our people have been aroused to realize the value of the splendid stand of native timber along their highways.

With the rapidly increasing number of people who tour for pleasure and with the increasing number of paved highways, it is recognized as an important business proposition to preserve our trees and those beauty spots which attract tourists. The joy of a scenic stretch of highway spreads rapidly; beautiful trees have a good deal to do with this. With the growing love for outdoor life, it is easy to start a movement of this kind through a little publicity, if some prominent business man, state official, or newspaper takes the initiative. The results all tend toward the upbuilding of a better citizenship and making a finer country in which to live.

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# Fish Give Oil to Indians

By FRANCIS DICKIE

BUTTER from a fish? Sounds ridiculous! Nevertheless it is true. In March only, the butterfish, or oolichan, comes from the Pacific Ocean's unknown deeps and goes up fresh water rivers of British Columbia. The oolichan, having spawned in the fresh water, then disappears. Unlike the salmon it does not die, but returns to its haunts in the ocean. These fish, from six to eight inches long, are caught in nets by millions, thrown into rough bins of cedar bogs to lie for a few days to soften in the sun, then are put into great cedar vats of boiling water, the water heated by dropping hot stones into the vats; this strangely enough, makes better oil than when fish are boiled in an ordinary way, and most Indians stick to the ancient way. When oil rises to the top it is skimmed off into watertight cedar boxes, wonderful affairs in clever joining. It hardens, and good oolichan grease can hardly be distinguished from lard. It is almost pure oil, and is to the Indians what butter is to whites. The Indians get a year's supply of life sustaining fats during about three weeks' time. When well rendered it has no suggestion of fishiness.

GETTING THE OIL FROM THE FISH

The oolichan, six inches long, is a British Columbia fish from which the Indians make a sort of butter of great food value.

# The Long Trail from Maine to Georgia

COOPER'S works have been translated into many languages. His Leatherstocking Tales have been read to the four corners of the world. Natty Bumppo, Uncas and Chingacook are the book friends of millions. Young and old have imagined themselves looking down on fair Lake Otsego from Natty's Cave. They have followed him over the trails and practiced woodcraft by his side. They have joined with him in his struggle between the urge of his forests and paths and the call of human kind. They have been happy that he chose the wilds.

Most all of us are Natty Bumppos. However much we like to be with our fellows, the urge of the quiet trail is within us. It may be buried beneath thick layers of cityfication, flabbiness or just laziness. We may try to cure it with doses of theatre, novels and motor cars. Still it is there, likely to win out at any moment and carry us out on the winding trail, to meet nature and to wonder and learn.

Photograph by Guy L. Sharey, Gorham

BIRCH-BORDERED FOREST TRAIL

Hikers' pathway that leads to forest, mountain, and a wealth of scenic beauty, from a point near Gorham, New Hampshire.

During the past few years the recruiting of the army of hikers has been amazing. Outdoor, mountain and walking clubs have grown hundred fold. They are found from east coast to west, and their members are becoming legion. The result has been trails, weaving through forest, climbing mountains and dipping down into valleys. Over them thousands tote their packs, sleeping nights in rude lean-tos or trail club houses, and in the day talking the language of nature; thinking the thoughts of the great outdoors—better citizens.

As a trail-maker, the Appalachian Mountain Club of Massachusetts was a pioneer. During the fifty-five years of its life it has put through several hundred miles of trail in the White Mountains of New Hampshire and over into Maine. Some dozen years ago the Green Mountain Club of Vermont went to work, and today it has the glorious Long Trail stretching for 240 miles along the backbone of the Green Mountain range Other clubs more recently have built new trails near to and often crossing the larger ones. The United States Forest Service has cut wood-ways into its forest areas in the northeastern states.

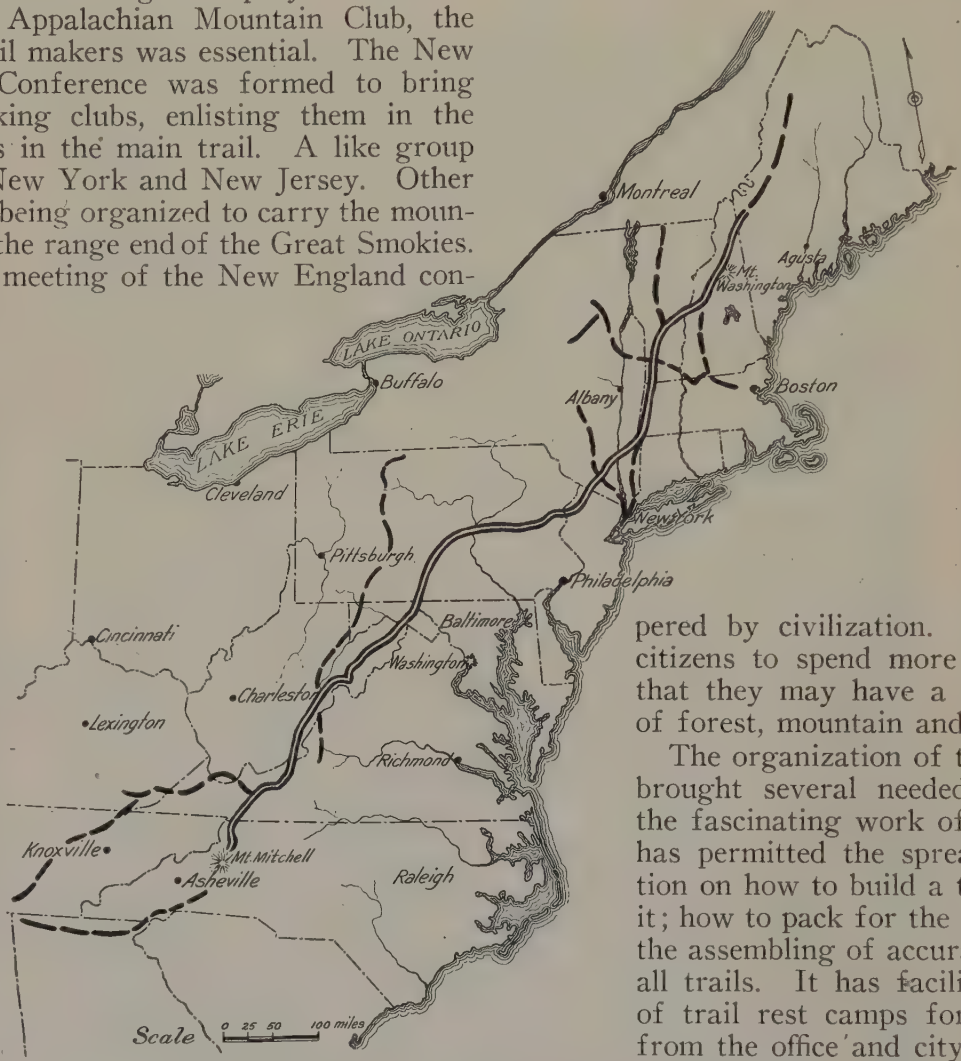
Nearly three years ago Benton MacKaye of the American Institute of Architects had a dream. He saw a mountain and forest trail reaching from Maine to Georgia—a super-trail. He pictured this as an approach to the problem of living from a new angle. The people along the route of the great pathway through nature, he felt, would have "a chance to study the dynamic forces of nature and the possibilities of

shifting to them the burdens now carried on the backs of men."

"The reposeful study of these forces," he said, "should provide a broad-gauged, enlightened approach to the problems of industry. Industry would come to be seen in its true perspective as a means in life and not as an end in itself."

This was vision. It meant the linking up of existing trails into a great trunk system. Cooperation was necessary, and although the project was first the aim of the Appalachian Mountain Club, the help of other trail makers was essential. The New England Trail Conference was formed to bring together the hiking clubs, enlisting them in the building of links in the main trail. A like group was created in New York and New Jersey. Other trail makers are being organized to carry the mountain pathway to the range end of the Great Smokies.

At the recent meeting of the New England conference great progress was reported. So far as the northern New England States are concerned, the dream is virtually a reality. The network of trails which already exists there as a basis for the trunk line system needs comparatively little expansion. Swinging down from Mount Katahdin and Mount Washington, across New Hampshire, the main trail links with the Long Trail as it skylines down the Green Mountain range. Striking through the Berkshire Hills of western Massachusetts, it will cut across the northeastern corner of Connecticut to the New York boundary near Pawling. Already a considerable part of the trail has been cut as it heads across New York and New Jersey to the Delaware Water Gap. Following the ranges of Pennsylvania, it will cross the line about halfway across the state, and then will swing almost due southwest to its terminus in northern Georgia.




THE TRAIL FROM MAINE TO GEORGIA

The scenic route which hikers may take for travel along our eastern forest lands.

It sounds like a considerable order. Yet it is not nearly so formidable as it was when first brought forward. So rapid has been the growth of the ranks of trail makers and trail followers, that the force of numbers promises reality for the dream. The growth of public sentiment may be measured by a strongly supported bill before the Massachusetts Legislature empowering the Commissioner of Conservation to map, lay out and maintain trails.

Benjamin Loring Young, Speaker of the Bay State House of Representatives, is behind the movement. His reasons are explained when he says: "The state should guarantee to its citizens at least a right of way through the great resources given them by nature. It can and should aid and encourage the building of trails through the wilder sections where nature can be found unhampered by civilization. Let us urge our citizens to spend more time in the open that they may have a great appreciation of forest, mountain and stream."

The organization of trail clubs has also brought several needed developments to the fascinating work of trail making. It has permitted the spreading of information on how to build a trail; how to mark it; how to pack for the hike. It has aided the assembling of accurate information on all trails. It has facilitated the building of trail rest camps for hikers too fresh from the office and city. It has provided a clearing house for the ideas, aims and achievements of the growing body of nature and outdoor lovers.

For all these refinements, the work of trail making has always one central thought. The trail must be natural. It must suggest the unknown and uncertain ahead. It must seem to lead away from civilization. In laying out the route there can be striving for the view of a beautiful valley or a majestic mountain peak, but the builder should not strain for these effects. On these principles most of the trails are being made, and where hundreds are today, thousands may tomorrow hike forth to safeguard health in the great outdoors and gain wisdom from companionship with nature.

# Training Teachers of Nature Study

By J. Andrew Drushel
Harris Teachers' College, St. Louis, Missouri

THE outcome of a course in nature study should be an equipment that will make the child want to go out into the vast home of nature for enjoyment, recreation, and investigation. Conversely, when he returns from outdoors this same equipment should make him want to know more of the literature of outdoors both informational and inspirational in character.

For more than ten years there has been more or less unity in regard to aims, materials, and methods in nature-study courses* as found in twenty states and thirty large cities. The primary aim seems to be to develop and direct the child's interests in nature. The secondary aim seems to be to establish a scientific attitude of mind so as to result in careful investigation and clear and truthful statements on a given subject.

As to materials, the common things of the child's environment, selected from the standpoint of his interests, furnish the subject matter. The courses represent breadth and variety of contacts rather than intensive study of a few things. Soil, plants, animals, weather phenomena and sky, physics and chemistry are the general topics commonly found in nature-study courses. "The plant topics are trees, seeds and fruits, wild flowers, weeds, garden plants, farm crops, fungus diseases, bacteria, plant structures, classification." Among animal topics are found pets, birds, toads and frogs, fish, reptiles, insects, earthworms. The usual topics under weather and sky are rainfall, weather charts, weather maps, movements of sun and moon, identification of a few stars, and constellations. The home for the most part provides the topics in physics and chemistry.

As to method all the courses in nature study emphasize actual observation. The field excursion, observation of objects at home and on the way to school, and encouraging children to bring interesting material to school, are suggested in more than ninety per cent of the courses that are prescribed.

The above paragraphs describe rather accurately the situation which confronts the young teacher entering the school room. What ought she to be able to do with it? She should be able at the end of her two-year training course to carry out with the help of sympathetic supervision a well planned nature-study course built in the manner suggested. Such a teacher should have an acquaintance with the natural history of the region from which her pupils come. She should know something of the literature of outdoors, and, what is worth more, she should have a keen desire to know more of outdoors and of the literature of outdoors. This is the St. Louis program. We are not now reaching this goal. We have not at any time reached it. We are still hopeful.

What can the teachers' training institution do? In the first place, it can eliminate the hopelessly unfit if it has a faculty whose members have the courage to perform their duty. In the second place, such an institution can give those who ought to become teachers a knowledge of four factors* essential to good teaching. These factors are: (1) the subject matter to be taught; (2) the child; (3) the method by which the subject matter is to be made a part of the child's experience; (4) grasp of a much broader field of the subject matter than just that which is to be taught.

In the third place, a teachers' training institution can provide courses designed to prepare teachers of specific content. It seems to the writer that every course given in a tax-supported teachers' training institution must justify itself on one ground and one ground only. That ground is contribution direct and specific to the equipment of the young teacher for her task. Every hour spent which does not contribute toward this end is an hour wasted.

* Mitchell. Nature Study Review, October, 1923.

* Trafton. Nature Study Review, March, 1914.

# How Children May Study Animals

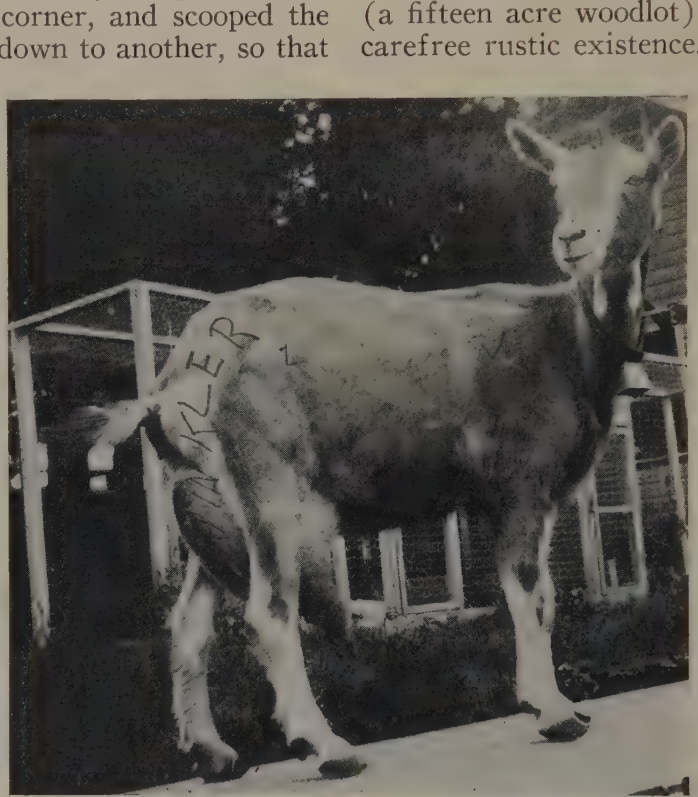
By ELIZABETH K. PEEPLES

ONCE upon a time two little girls were taken from their home in the city to spend the summer on a Virginia farm. Not many minutes after their arrival they disappeared. It was not until an hour later that grandmother, mother, aunts and uncles began a vigorous search for the absent ones. At the end of half an hour they were discovered, "the Older One and the Younger One," in the pig pen! Armed with old stubs of brooms they had swept the straw and cobs from the wooden floor of the pen proper. In the yard adjoining they had piled up the stones in one corner, and scooped the softest portion of the mud down to another, so that the remaining space was at least semi-solid. Their shoes, their immaculate white stockings, their perky gingham frocks, their faces, hands and hair were bespattered with the mud of the outdoor portion of the pen, and powdered with the dust of the interior, but their faces wore the smile not easily removed.

"Can these be my children?" wailed their grief-stricken mother. "What are you doing?"

"Cleaning the pig pen," came the exultant chorus.

The tubbing and shampooing administered those youngsters are a matter of family record, but in their hearts was a new-found joy which no amount of soap and water and scrubbing could quite wash away.



THE GOAT WAS A FAVORITE

The children soon learned of the characteristics of this valuable and interesting animal.

That afternoon they had entered a world whose actual significance their elders did not dream—a world which for them retained its reality and vital interest through successive vacations on the farm until they grew up. And this new world was the barnyard. The pig pen became its center, but let us hasten to explain, it was no ordinary sty. An upstanding frame building of two stories it was, with an entrance hall across the first floor front, from which the beverage beloved of pigs could be poured into the troughs that extended the width of the two rooms back of it. At one end of the entrance hall was a stairway—real honest-to-goodness stairs—leading to a room above, the size of the entire edifice. This was often used as a corn crib. It had wooden windows which opened outward like little doors set too high in the wall to permit any possibility of falling out. Back of the building was the muddy yard where the pigs wallowed. It was a fascinating bit of architecture—one which intrigued the imagination. One could fancy the entire structure moved to the heart of the forest (a fifteen acre woodlot), where one might enjoy a carefree rustic existence. But even as the gem of the barnyard and within easy reach of civilization, it was a charmed spot—a mansion unequaled for comfort and beauty—best of all, a *real home*.

The Older One became Mrs. Pig. The largest pig in the yearly collection was always Mr. Pig, and the others, in order of their size, were Jim Pig (a young chap about town); Pink Pig (who at the present day would be designated a flapper); some half dozen other pigs, and the Baby Pig, a role naturally assumed by the runt of the family.

That the game go on, the Younger One was Mrs. Dog. The granary, another architectural triumph, became her domicile, and the house dog and all the cats on the place her family. To include the cats in a family named Dog has always seemed to us a display of great breadth of view on the part of these children.

Other buildings in the barnyard fell into line. The barn was the Town Hall; Hen House hotel the chief hostelry; the stables were the homes of Mrs. Cow and Mr. Horse; the chicken yard with its numerous small coops for young families took the name Chicken Park, as befitted a fashionable suburb; and the larger coop where "clucks" were confined when grandmother did not want them to

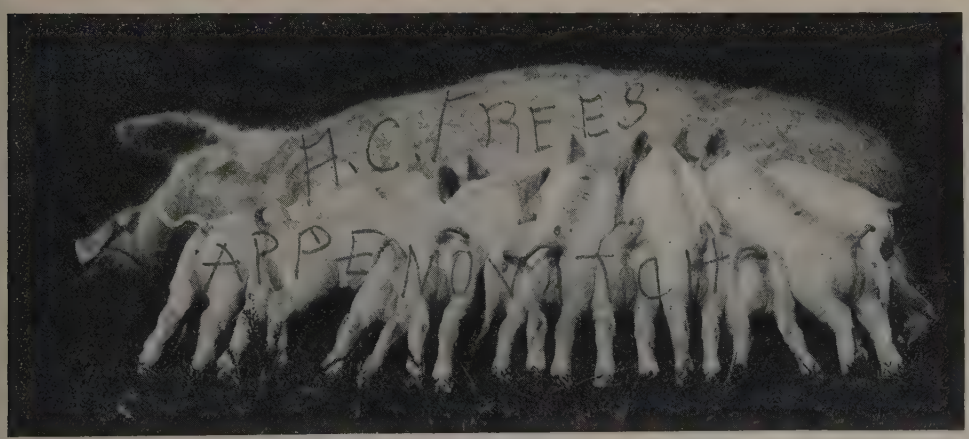
"set", became the Jail. For scenery there was the straw rick out behind the barn, grander, more imposing than the Rockies. Sincerely do we question whether any adventurer, the first to scale some lofty peak in the Alps or the Himalayas, ever ex-

CHILDREN LOVE TO SEE YOUNG ANIMALS

This group included thirteen youngsters whose sole ambition in life was to play, eat and sleep as much as possible each day.

tracted therefrom greater exaltation of spirit than did the Older One and the Younger One, when one memorable day they achieved the summit of that slippery deceptive heap of straw, and *slid down.*

Wood Pile too must needs be mentioned, a fearsome spot, a kind of guillotine where many a scion




PART OF THE BARNYARD FAMILY

Interest in these young pigs gave the children a fascinating pastime and made them lovers of all nature in and about the farm.

of chicken nobility lost his life for the public good.

Now the best authorities decry any attempt at personification in nature study, and they are absolutely right—birds, beasts, flowers, and trees have an interest all their own. It is not our intention to suggest that a game like "Mrs. Pig and Mrs. Dog" be introduced by any teacher either of the home or school, though we wish more children might play it. The story is told merely to show how, through this game, born of their own fancy, two little girls were led to keen, close, and intensely interested observation of the animal and plant life of a barnyard. Mrs. Pig and Mrs. Dog compared notes on the appearance, dispositions, and habits of their families and neighbors until the very curl of a porker's tail, and the sinewy play of a cat's muscles became part of their inner consciousness. They learned many interesting facts—that even a pig may eat too many green apples, that some pigs were more intelligent than others, that a little kitten may be as affectionate, docile and teachable as the gentlest puppy, or more untamable and timid than a woodland creature. They did not know much of heredity, but they observed the difference in their pets. They discovered that Mrs. Cow, though decorated with awe-inspiring horns, was little inclined to use them save when she had a baby to protect. They found to their sorrow that the old horse, recently purchased, did not like to be petted—because he had been mistreated, grandmother said. And the day that the Older One almost toboganned down old Molly's neck when she waded into the pond for a drink, she learned in a manner never to be forgotten, that all the water a horse drinks has to *be elevated* into its stomach.

To try to tell you half of what they learned of baby chicks, chicken language, of every farmyard bird and beast, aye, even of the weeds, some of which the pigs devoured with that delicious smack, smack of satisfaction, while others were trampled in scorn, would be to take unfair advantage of your courtesy and patience. But so deep was the impression on their own minds that it reacted, and found outward expression in the publication of a weekly paper, "The Barnyard News," old copies of which are still occasionally laughed over and returned to their place in the dust of the treasure-house in the attic.

Sad to say, there was no one among the grown-ups who sensed the full significance of all this; the children's happiness in their game was noted and approved; the Barnyard News was read regularly, applauded and paid for; but no one pointed beyond the barnyard to the birds, the insects, and the wildflowers. It would have taken only a word. One or two well chosen books at that time might have given to those youngsters a fund of information greater than they shall ever be able to acquire in maturity. The love of the birds which they occasionally noted about the barn, on the garden fence, or in the meadow grass was already in their hearts; but no one told them that these were swallows, songsparrows, and larks. They adored lying under the apple trees and listening to the drone of the insects in the grass, but no one hinted that there lay a world more complex than the life of the barnyard. They picked ironweed, and wild pink and evening primrose, but seldom did they learn a name. It was a calamity. But nature study was less fashionable then than now. Those relatives who insisted upon piano lessons and French were sincere in their desire that the children have the best of everything. But today could we forgive ourselves as we forgive them for similar omissions?

GENTLE, ANGRY AND CURIOUS

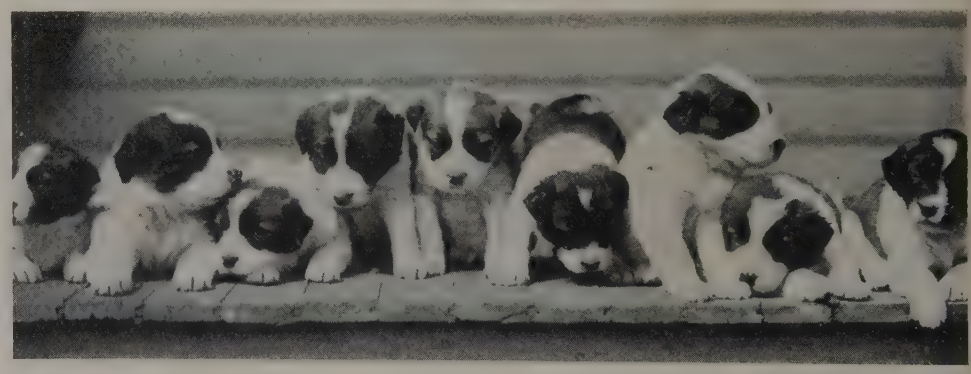
The children learned that kittens may be affectionate, docile and teachable or more untamable and timid than a woodland creature.

It is as natural for a child to love nature as that he love his mother. And if we withhold the possibility of the full flowering of the former love are we not almost as criminal as if we were to place an obstacle in the way of the latter?

Show me a child who does not love a kitten or a puppy, and I will show you the unhealthy product of unnatural upbringing.

To study animals with children from seven to eleven or twelve years of age is as sure a road to happiness as taking them to a circus. Often that is a good way to begin. But even after a circus, beginners in animal study should commence with a domestic rather than a wild animal, because of ease in observation and the possibilities for intimacy, if for no other reasons.

The dog, the cat, or a little pig makes an excellent introduction to animal study. Let us assume that it is the last mentioned which has been chosen. Remembering the first litter of these fascinating creatures that you ever saw, you will agree that it is pathetic that every child may not see nine or a dozen baby porkers lined up with military precision, intent upon the business of getting a meal from the first commissary provided them by nature, or, filled to the brim, attempting sleep in a heap whose instability makes sleep impossible, because each piglet insists on being at the bottom. Yet only in country communities, or in homes or schools of rare facilities could such a consummation as a sow and litter be achieved. To have one little pig to study is about as much as most of us dare aspire to. The parent will have to buy or rent his pig, but the request of a loan for school use brings a universally generous response, and stock owners and commission merchants we feel sure prove no exception.



NINE DOG DISPOSITIONS TO STUDY

The children quickly learned that every animal is somewhat different from the others and that dispositions and habits repay study.

But to return to our borrowed pig—he deserves a place in the sun, and if he is to be kept more than one day, should be given comfortable quarters in a corner of the yard, house or school, according to

circumstances, but a shaded area into which to retire upon occasion. Everybody knows what a pig needs to make him comfortable. Be sure that he gets it all, not merely for his own sake, but that the audience which is to gaze upon him may learn from observation that he enjoys a clean pen, with a clean straw bed under shelter; that, in addition to varying food mixtures administered in liquid form, he should have clean water to drink; that ashes may be used in helping to keep the pen sanitary, and that plenty of fresh green food is a necessity. The children will enjoy pulling weeds for him, and can in no way better learn to know the weeds themselves. For a single lesson this animal, as easily as any other, may be brought indoors for convenient study.

A little pig is so brim full of personality and displays so many interesting physical characteristics that one scarcely knows where to begin. The children, however, decide the question, and comment freely upon the curl of his tail, his queer flat nose so like a button, even to the places for thread to go through, with its sensitive, questioning twitch, his strong jaws and sharp teeth, the pointedness of his snout, his eyes like ill-made buttonholes with the brightest of jet buttons peeping through, his flopping ears, which so increase the allure of the glance he gives you, his stiff bristles which fail to conceal the pink skin, his heavy body, tapering legs, and tiny cloven hoofs. His special methods of using these various parts can only be well studied by means of observations covering several days. And with his other manifold charms we are forced to grant that he is eloquent. What human utterance voices the anguish of a porker's squeal as he entreats for food, or the utter satisfaction of his grunt when his stomach is filled?

LOOKING UP TO THE OLD FELLOW

Reliance on the experience and strength of age is a lesson indicated by this picture. This is one of the benefits gained by children through nature study.

It is always interesting to compare the anatomy of another creature with our own, and it will prove so in locating the pig's shoulders and hips, elbows and knees, wrists and ankles, finger and toe nails.

If the animal is kept out of doors and watched for several days the children will grow familiar with certain pig habits, such as rooting and wallowing. They should be told the reasons for these phenomena, if conditions do not permit their discovery. Nor can they fail to learn something of the bill-of-fare which one might prepare for his pigship. Certainly in justice to pigs in general, two facts should be impressed—that in the wild state they are intelligent, and would be in domestication, were it not for the overfeeding which man gives them because they fatten marvelously, and because he likes ham and pork chops; and that wherever clean water is to be found the pig is clean. Its mud baths are but further evidence of cleanliness, as they are a way of keeping down vermin (a secret of the toilet which has found its way into fashionable circles, though presumably for a different purpose in this latter instance).

The names of the father and mother pig, boar and sow, and the word "litter" should be used in all discussions of the pig family. After acquaintance is made with one of our domestic swine the family tree proves of interest, and some investigation of the kinds and characteristics of wild hogs may be in order.

Where children have had the benefit of trips to the farm, and a live pig is exceedingly difficult to get, pictures—if they are plentiful and good—may be used. They will recall the live animals seen on the farm and a very interesting lesson will result from a study of these reproductions.

# The Order of Merry Men, a Nature Club of Boys

By SUSAN SIPE ALBURTIS

I, a woman, am an honorary member of the Order of Merry Men, a small organization of boys at the National Capital, banded together by their interest in the out-of-doors. That honor has but recently been conferred upon me, and I believe that I am the only one of my sex so honored, but of the other sex there are more, with ex-President Wilson at the head of the list. His letter of acceptance hangs on the clubroom wall with his picture above it, and the flag above them both. After reading this letter it is not difficult to understand why the boys send him flowers on his birthday, and the Order of Merry Men always has a representative in the gathering at Mr. Wilson's home on Armistice Day.

To tramp through the woods with the ideas of conservation and protection uppermost; to acquire keenness of observation; to collect where collecting is permissible and to follow these collections through the diverging lines, geology, botany, ethnology, art, economics, are some of the objects these boys are promoting, though they would never express them thus. Through the skilful guidance of sane parents, sufficiently sane not to allow their guidance to be too much in evidence, these objects seem to be on the way to "unbroken success."

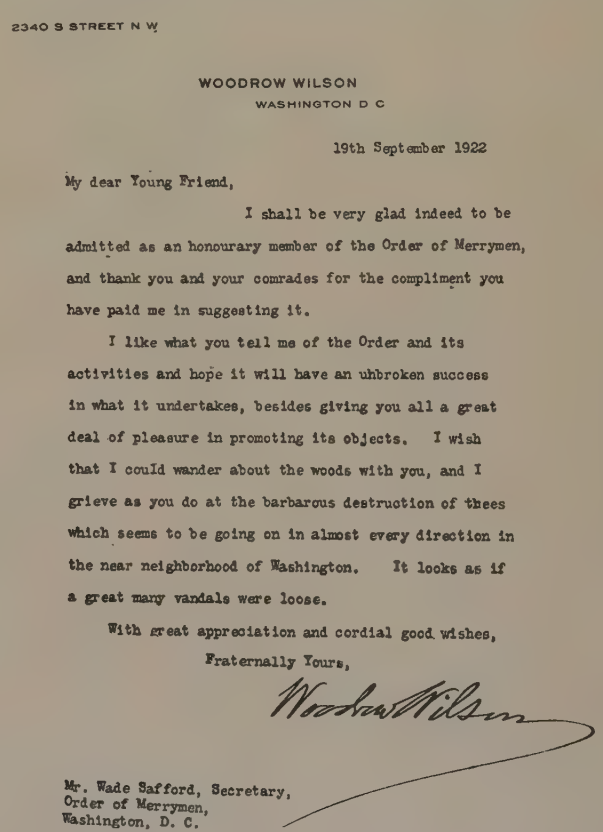
WINTER HEADQUARTERS OF THE NATURE CLUB OF BOYS

A corner of the room showing specimens collected by the boys and eagerly studied. The table tops are covered with geological exhibits. This club affords the boys much fascinating and instructive entertainment.

Eleven boys are members of the order, all of whom at present are of Junior High School age. The father of one of the boys, a boy with boys, has from the beginning been an active member of the order, four times holding the office of president. The term of office is short that every member may have the chance. All the other fathers are honorary members. The combination of clubroom and museum is in the atttic of the home of the secretary who received Mr. Wilson's letter. It was here that the writer attended a recent meeting. Think of the joys of a real attic from which to get stools and chairs for the club meeting; to unearth the old, old what-not of Dad's grandmother for the mineral collection and an old desk to give dignity to the presiding officer and the secretary! Well chosen Perry pictures show the healthful ideals of youth. Robert E. Lee and U. S. Grant, Abraham Lincoln and Jefferson Davis flank one another in happy forgetfulness of the days of strife. A charcoal sketch of his own Teddy bear by Clifford Berryman, and a picture of Linnaeus represent the animal and plant world. A part of the museum is devoted to souvenirs donated by friends and relatives who have been to other parts of the world. Among them is a piece of a dress belonging to Queen Victoria; a fragment of the Rock of Gibraltar; a vase from a Peruvian Aztec grave; a spear-head from Egypt; a sword from Samoa; a helmet picked up during the parade in honor of General Pershing; a stone from the wrecked Knickerbocker Theater. The body of the collection, however, is from the out-of-doors that the boys live in. Minerals and rocks predominate. Specimens are numbered and the names catalogued after the method of the National Museum, for the boys are well acquainted with the museum and its curators. They try to learn the origin of their specimens. They are keen observers and the spirit of investigation runs high. Recently two of the Merry Men noticed that the coal being delivered to a neighboring ice-plant contained a large percentage of iron pyrites, and so notified one of the employes. Upon further examination not only iron but seams of coal a half inch in thickness embedded in lumps of clay of carboniferous times, the boys found, were being sold to the manufacturing concern for coal, all of which was interesting from the geologist's point of view, but not to those paying for heat. Breaking open a large lump, regularly placed circles—"fossils" to the boys—were disclosed. Off to the National Museum went the boys, where they learned that a lepidodendron, "a scale bearing tree," had in its death left its scale marks in the coal measures. The inquisitive eyes of two Merry Men had brought them to the same sunlight that had made them millions of years ago.

Part of the new business of the November meeting was the presenting to the club of collections made by individual members during vacation. Iron and zinc ore from Vermont; pseudomorphic quartz from New Jersey; limestone from old seabeds now mountain lands, containing trilobites and fossil imprints of shells, were handled by these youngsters in a manner that would have done credit to those of mature years. In addition to the central collection each member has his own private one.

Winter headquarters in an attic are satisfactory, but in the open season there must be a field house. For this the boys are restoring an old springhouse in Piney Branch Valley. It is known as the "Fort of the Merry Men." The ground has been surveyed and mapped. One reads on the map, Newt



2340 S STREET N W

WOODROW WILSON
WASHINGTON D C

19th September 1922

My dear Young Friend,

I shall be very glad indeed to be admitted as an honourary member of the Order of Merrymen, and thank you and your comrades for the compliment you have paid me in suggesting it.

I like what you tell me of the Order and its activities and hope it will have an uhbroken success in what it undertakes, besides giving you all a great deal of pleasure in promoting its objects. I wish that I could wander about the woods with you, and I grieve as you do at the barbarous destruction of thees which seems to be going on in almost every direction in the near neighborhood of Washington. It looks as if a great many vandals were loose.

With great appreciation and cordial good wishes,

Fraternally Yours,

Woodrow Wilson

Mr. Wade Safford, Secretary,
Order of Merrymen,
Washington, D. C.

EX-PRESIDENT WILSON ACCEPTS MEMBERSHIP

Valley, Prince Albert River, Mayapple, Laurel and Darwin Hills, reminding him of the map in Peter Pan in Kensington Garden. "Madam," an old crayfish, lived for many years in the banks of Prince Albert River, but finally succumbed to "nerves" brought on by over attention of boys. While clearing away the rubbish around the springhouse an odd brick, tiled on the narrow faces, was upturned. Distinctly impressed in it was "Farnley Iron Works, Leeds, England." Immediately a letter went to the Mayor of Leeds asking for a clue as to the age of the brick. The Lord Mayor referred the letter to the firm, which is still in existence. So gracious was his reply stating this that the Lord Mayor of Leeds became an honorary member on

the spot. The Farnley Iron Works has not had this distinction conferred upon it as no reply has even been received and the age of the brick is still unknown.

The order plans to label all the dogwood trees in the vicinity of the field house and to practice reforestation. A part of their dues will be spent for seeds. "We shall hatch them out in the back border of the garden, Dad, and then transplant them." Dad did not seem enthusiastic about the use of the back border of the garden, but he did not say "No."

Another portion of the dues pays for a subscription to Nature Magazine. Notice had just been received at the meeting I attended that the time for renewal had arrived. The funds in the treasury were low. An extra assessment was necessary. Even though it took one boy's last "six cents," Nature Magazine will be on the club's reading list the coming year.

Such clubs, known by other names than the Order of Merry Men, can be formed wherever there are boys and sane parents and teachers to guide and sane ex-presidents and lord mayors to be fraternal members of such worthwhile organizations.

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## Natural Science and Nature Study in the Schools

The following is the course of nature study advised by the Department of Applied Education of the General Federation of Women's Clubs, for Grade Two.

It can readily be adopted by a mother as a course in nature study for her children, or can be made the basis for study by any lover of nature.

### Grade Two

**Gardens**

Harvest—garden crops.

Clean up and burn rubbish (bonfires).

Collect seeds of many garden plants and put them up in packets for use next spring.

Set bed of daffodils.

Collect seeds of butter-and-eggs and bouncing Betty.

Prepare pots of tulips and set in trenches out of doors to bring in for bloom in the school room.

Bring in tulips and rear for winter bloom.

Raise pot marigolds in the window boxes and also butter-and-eggs and bouncing Betty from the seed collected in the autumn.

Start tomato, cabbage, egg-plant, asters, petunias, pansies, and verbenas in shallow boxes of earth in March so as to have them ready to set out early in May.

Learn to transplant.

Set out cabbage, tomato, egg-plant, asters, verbenas, petunias and pansies.

Stake, prune and train tomatoes.

Raise pole lima beans.

**Toys and Home Appliances**

Let children play with magnets, iron filings and compasses. Let them find out that one end of magnet attracts one end of the compass needle and repels the other end.

Demonstrate boiling of water, evaporation, "clouds" of steam. Learn cloud forms.

Let children play with glass plate supported on books with tissue paper dolls underneath, the glass rubbed with silk. Play with comb rubbed with silk, and bits of paper; with sealing-wax rubbed with silk and pith balls. All this will give them some notion of frictional electricity, and some experience with its behavior.

Make willow or ash whistles of several sizes. Let the children discover that small whistles make high notes, large whistles low ones.

Make rattle-box. Fasten a notched wood wheel or one from an old clock works to a wood handle. Fasten a small box-like frame to the handle so it will revolve around it and allow one thin, reed-like side to press its edge against the wheel. Whirl the frame; the faster it goes the higher the note.

**Pets and Domestic Animals**

Preparation of animals and plants for winter.

Have children report all things they observe that animals and plants are doing to get ready for winter.

Winter condition of animals and plants. Find where animals are in winter. Hunt for insects, frogs, etc. Learn where the squirrel is, the groundhog, fieldmouse, where the birds are. Study buds, bulbs and seeds enough to see the quiescent stages of plants.

Animal Homes. Secure specimens of animal homes—last year's bird nests, wasp nests, etc.

Take field trips to see where squirrel lives, to see muskrat houses, nests of fieldmice, rabbits' holes, etc.

**Correlated Materials**

The common fall insects: Bumble-bee, cabbage butterfly, carpenter ant, Carolina locust, cicada, cricket, damsel fly, dragonfly, fiery hunter beetle, monarch butterfly, mourning cloak, muddauber wasp, plant lice, red admiral butterfly, red-legged locust, robber fly, searcher beetle, squash bug, tomato moth, tussock moth, viceroy butterfly.

Cricket: Feeding, movements, music.

Have pupils each make a collection of common minerals and rocks.

Learn to recognize quartz in its several forms, feldspar of the several varieties, mica, hornblende, calcite, talc, sandstone, conglomerate shale, slate, granite, basalt, diabase, gabbro, quartzite, gneiss.

Learn to know the common birds: American bittern, American goldfinch, American woodcock, blackbird, redwing, bluebird, blue jay, bobolink, chickadee, cow bird, crow, grackle, grebe, hermit thrush, herring gull, killdeer, kingbird, kingfisher, meadowlark, mourning dove, night-hawk, ovenbird, phoebe, robin, screech owl, solitary sandpiper, chipping sparrow, song sparrow, sparrow hawk, common and black terns, towhee, black and white warbler, woodpecker—flicker, downy, hairy, red-head, sapsucker, Virginia rail.

Nest building, feeding tables, bird baths and houses.

# The Shoe Bill

By H. S. BRYANT

United States National Museum

AMONG the many curious birds occurring in Africa those conspicuous for their beauty have frequently been pictured, but the shoe bill, which is unique in its outward appearance and in its physical characteristics, probably holds the palm for ugliness.

It is one of those peculiar anomalies, of which there are several occurrences in nature, which partake of the scientific characters of two entirely different families. Because of its peculiar appearance and confusing physical characteristics, its proper classification was for a considerable period in doubt, and was the subject of much discussion among ornithologists. For a time the bird was placed in the pelican family, but a further and closer study of the structural features of the single species known has resulted in placing it intermediate between the storks and the herons.

It occurs only in a somewhat restricted area near the White Nile, where it congregates in groups of from two up to flocks as large as a hundred, frequenting dense swamps and subsisting chiefly on small fish, snakes, animals or even carrion. When startled it takes to the air quickly, flying a short distance much in the manner of the heron, and then alighting to see what the cause of the disturbance was. Although a swamp dweller as a rule, it frequently alights on trees.

United States National Museum

THE SHOE BILL OF AFRICA

This bird with the huge bill stands from three to five feet in height and is considered one of the ugliest on that continent.

In the rainy season during July and August, the birds choose a spot for a nest in the reeds or high grass close to the water's edge, where a hole is scraped in the earth. Here, without any further attempt at nest-building, the eggs are laid, sometimes as many as a dozen at a time.

The shoe bill is of a dusky gray color and stands from three to five feet in height on slender, black legs. The small tuft of feathers on the top of its head, together with the peculiar beetling expression about the eyes, of which the iris is usually a bright yellow, and its ridiculously large, yellow bill, plentifully splotched with brown, gives it a particularly ludicrous appearance.

The huge bill is, of course, its most striking characteristic and the one from which it derives both its common and its scientific name, Balaeniceps rex, meaning "Whalehead King," from its fancied resemblance to the head of a whale.

Unlike most animals of such size and conspicuousness, the shoe bill is still rare in collections and, moreover, it was unknown until 1851, when it was brought to the attention of the Zoological Society of London by John Gould, the author of the most voluminous series of folio works on birds ever published. His announcement of its discovery was based on a specimen collected by Mansfield Parkyns, of Nottingham, England.

# Funny Feathered Fellows

By D. C. RETSLOFF

NORTHERN Queensland, Australia, is the home of one of the most giddy birds known to students of zoology.

It is a plump bird and quick on its feet. Its feathers are a beautiful dark glossy brown, which in certain lights take on a greenish tinge.

This bird belongs to the order of birds that have toes adapted for perching. (Passerine).

Its common English name is "bower" bird, so called because of its habit of building bowers as well as nests.

From Ralph M. Dean, who for several years was construction superintendent of refrigerator plants in Australia, comes the following story: "In the summer of 1920 I was situated in Northern Queensland, Australia. On Sundays and holidays I amused myself and learned many strange things by watching and studying the flora and fauna of that locality.

THE BOWER OF THE BOWER BIRD

How they build the run-way shown here, and play what looks like a game.

"One of the most interesting things that I came across was the bower bird. For hours at a time I've sat behind a cover and watched them at their work, and also have amused myself by seeing them play, with as much zest as children, their queer game of what I named, 'Carry and Drop'—surely a most amusing game.

"Generally a group of six or eight birds work together. First they select a clump of weeds or tall grass, and through the center of it make a run-way. They fasten the grasses together at the top, making the run-way covered. Two birds do this. They weave the ends of the grasses together until they are quite firm and mat-like.

"Meantime, the other birds carry small white pebbles, stones, bits of broken glass and crockery from different points and deposit them in a pile at one side of the bower.

"I've seen a bower bird take a piece of bright glass and carry it from one point to another fully a quarter of a mile distant. Blue and white are their favorite colors, and they seize them eagerly.

"The pile of stones, crockery, glass, etc., when gathered measures from a peck to half a bushel.

"After the bower is started the birds work without loafing on the job. It takes from two days to a week for them to complete the bower and gather the stones. Of course, the length of time depends somewhat upon the distance which they have to carry the pebbles.

"When everything is ready and finished to the satisfaction of one bird who acts as general manager, then the game begins. In his bill a bird will pick up a piece from the pile, run through the bower and drop it on the opposite side. He keeps at it, taking piece after piece, or pebble after pebble, just so long as he can do it without dropping one on the journey through the bower. The other birds stand watching. And as soon as the one carrying the stone drops it, there is a great flapping of wings and a shrill squawking as if the others were laughing at his misfortune in dropping it.

"Then one of the others takes his turn at carrying stones through the run-way. Again and again they move the rocks from one side of the bower to the other, never seeming to tire of the game and playing it with unfailing vigor."

The bower bird lives on the seeds from the grasses; on insects which he hunts on the tree trunks. He also is fond of the native fruits. He has a shrill, cheerful voice but seldom sings. Although the male is bossy, he makes a good father, a wonderful provider, and always remains true to his mate.

The bower bird is found only in Australia. His nearest relative in our country is the starling, a black bird with a metallic gloss and with spots of yellowish-white among his feathers. The starling is more friendly than his Australian cousin. He builds his nest near the habitation of man, selecting, when possible, the tower of an old building in preference to the branches of a tree.

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**A popular assortment of twelve easily grown Annual Flowers in the most striking shades and colors. They all flower within a short while after sowing seed and will furnish an abundance of flowers until frost. This collection, if purchased separately from our catalogue, would cost $1.55.**

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**Alyssum** — *Little Gem, White*
**Aster** — *Lavender King*
**Candytuft** — *Giant Hyacinth Flowered, White*
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**Larkspur** — *King of Blues*
**Mignonette** — *Allens Defiance*
**Nasturtium** — *Giant Dwarf Mixed*
**Phlox Drummondi** — *Finest Tall Mixed*
**Salpiglossis** — *Brown with Gold*
**Shirley Poppy** — *All Shades, Mixed*
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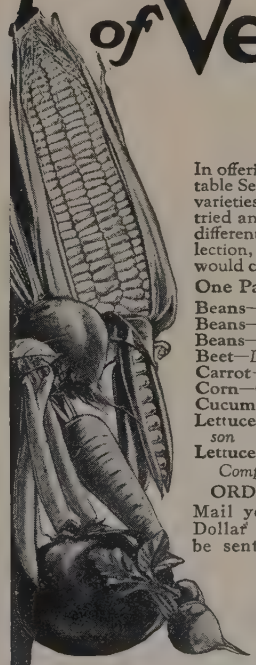

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**Corn**—*Golden Bantam*
**Cucumber**—*White Spine*
**Lettuce**—*Black Seeded Simpson*
**Lettuce**—*May King*
**Onion**—*White Portugal*
**Parsley**—*Curled*
**Peas**—*Little Gem*
**Radish**—*Scarlet Globe*
**Radish**—*White Icicle*
**Spinach**—*New Zealand*
**Swiss Chard**—*Giant Lucullus*
**Tomato**—*Selected Stone*
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It is a commonly accepted notion that to earn a living, it is most important to put in one's head all the special or technical information required to become a lawyer, or doctor, or engineer, or merchant, or what not. Read what one of America's most noted financial and economic authorities thinks about this:

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Thus it is that the men and women who percieve the **simplicity** of the great fundamentals become the leaders, and hire others to do for them the things which require merely technical knowledge or ability.

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If your mind is still open to new thoughts and ideas, why not let us submit the proof to you? This so-called "new idea" has stood the test of 25 years of searching study, experiment and application. Its final and complete expression in the "LIFIL" Course (pronounced Life-Phil) contains **workable, livable** principles and **exact, definite** methods for developing every power and faculty of the five great parts of your Personality—Body, Mind, Heart, Will, Faith.

It is, in truth a crystal-clear Life Philosophy—Life Phil—Lifil—filling Life with more Life, for Life. Regardless of your education, **if you are able to read the magazines,** you can grasp and apply its teachings. The youngest "LIFIL" student is a girl of 15—the oldest a man of 82.

### The Five Great Parts of Personality

Here is a brief taste of what the "LIFIL" Course will bring you:

BODY. Not simply for health, but for vigorous health. Condensed vital scientific exercises for body balance and nerve health. You will learn to love the "3-minute" exercise, and laugh while you do it, and every laugh draws a nail from your coffin.

MIND. Do you know the two strong forms of reasoning and the three weak forms? Have you Constructive Imagination—the source of all inventions and discoveries? "LIFIL" shows how to develop and use it in your business and social life. "LIFIL" gives a unique and distinctive training in the laws of concentration, creative thought and memory.

HEART. Any brief description of this part of "LIFIL" would only convey an imperfect and false idea of it. The two sections on Sentimental Love (sweetheart, sex, marriage) and on Civic Love are alone priceless to every thinking individual. The Nine Major Sources of Feeling, which sweep every man on to victory or defeat, are given you, and how to control them for more friends, clients, customers and success.

WILL. "LIFIL" does not simply talk about determination, persistence, push, focalization, conservation of energy, courage, self-reliance—but gives the actual exercises for realizing them in your life. Learn the new science of Mental Metabolism for success control—the very point where the millions fail. You will marvel that it has not been thought of before, taught and used in education.

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By doing we learn **life.** By reading we only learn **facts** about it. This course is a **doing** course. You really get life in all its phases, the Balanced Personality, the Fundamental Education, directly applicable to any man or woman in any walk of life—a fortune to the young, a new inspiration to the old.

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# News and Views

## The Louisiana Golf Coast Club

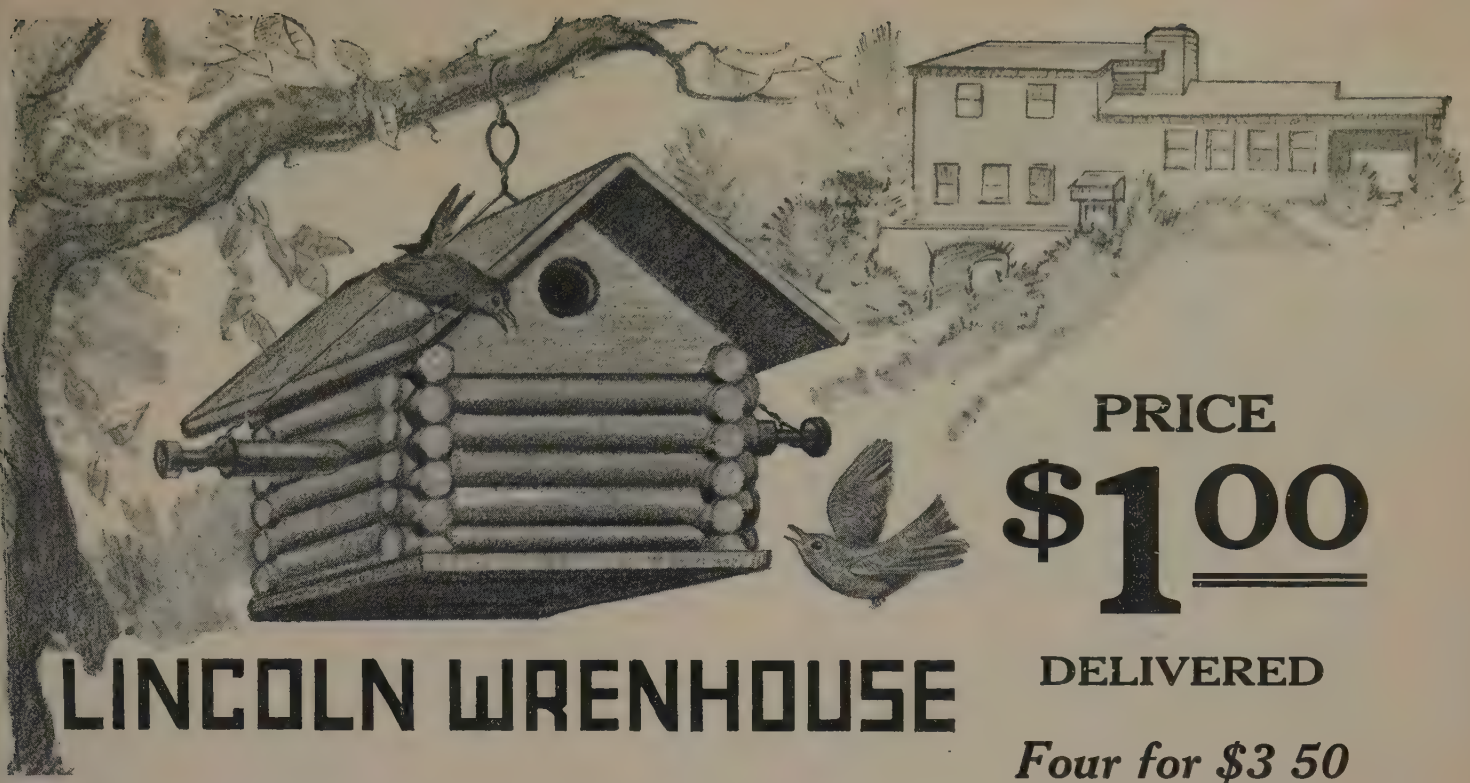
The project of Mr. E. A. McIlhenny, of Avery Island, Louisiana, for the organization of a shooting and fishing club to be located on some 80,000 acres of wild untouched land adjoining the Rockefeller Wild Life Refuge and neighboring on both the Louisiana State and Sage Wild Life Refuges, has been thoroughly aired in the press throughout the whole of the United States. Mr. McIlhenny was himself an acknowledged leader in the creation of the wild life reservations above mentioned, and previously attempted to secure the proposed club property for an extension of the protected area. Upon failure to do this, he began the promotion of a club to control the property, if not as a refuge, at least with regulated shooting to replace the present wholesale wild life destruction upon the land in question. Fortunately, the action succeeded in awakening the public to the dangers and necessities of the situation, and an active campaign, directed against the club idea, resulted in a definite plan for raising money to purchase the property and add it to the already existing game refuges of the state. Mr. T. Gilbert Pearson, President of the National Association of Audubon Societies, is one of the active sponsors of this new plan. It is understood that a start has been made in raising the necessary funds.

## The Poor Ostrich

Did you ever hear it said that, "So and So is a regular ostrich," referring to the belief that an ostrich thinks it can conceal itself from danger by burying its head in the sand? Once upon a time we were ourselves victims of the common superstition but naturalists now know that the ostrich does no such thing. Don't malign the poor bird.

## Scenery or Signs

On December first Minnesota's new law prohibiting advertising signs on the main highways went into effect. Thousands of signs, ranging from tin tags to huge billboards, are being removed. The law, unfortunately, covers only a narrow strip on either side of the road, but a movement has been started to wage war on the more distant signs also. Here is a chance for public-spirited citizens in other states to start something in the interests of both safety and the preservation of natural beauty.



# LINCOLN WRENHOUSE

**PRICE**

**$1.00**

**DELIVERED**

***Four for $3 50***

Invite a family of these little feathered friends to be your guests for the summer. Enjoy their songs—watch the little ones venture out into the world on their tiny wings.

This bird house is artistic and built on scientific principles — it looks like a miniature log cabin. Made of wood, tinted a soft brown that attracts the birds and has a strong, weather-proof roof. It comes ***knocked down*** and is easily put together. The price is only $1.00 delivered. (Canada $1.50 including duty and postage.) See your dealer or mail coupon today.

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Do you know the many beautiful colors and shapes obtainable in Evergreens? We will send you free for the asking, copy of Hill's 1924 De Luxe Evergreen Catalog. This shows 23 full page color pictures of Evergreens. You will greatly enjoy reading the 84 pages, with over 100 illustrations.

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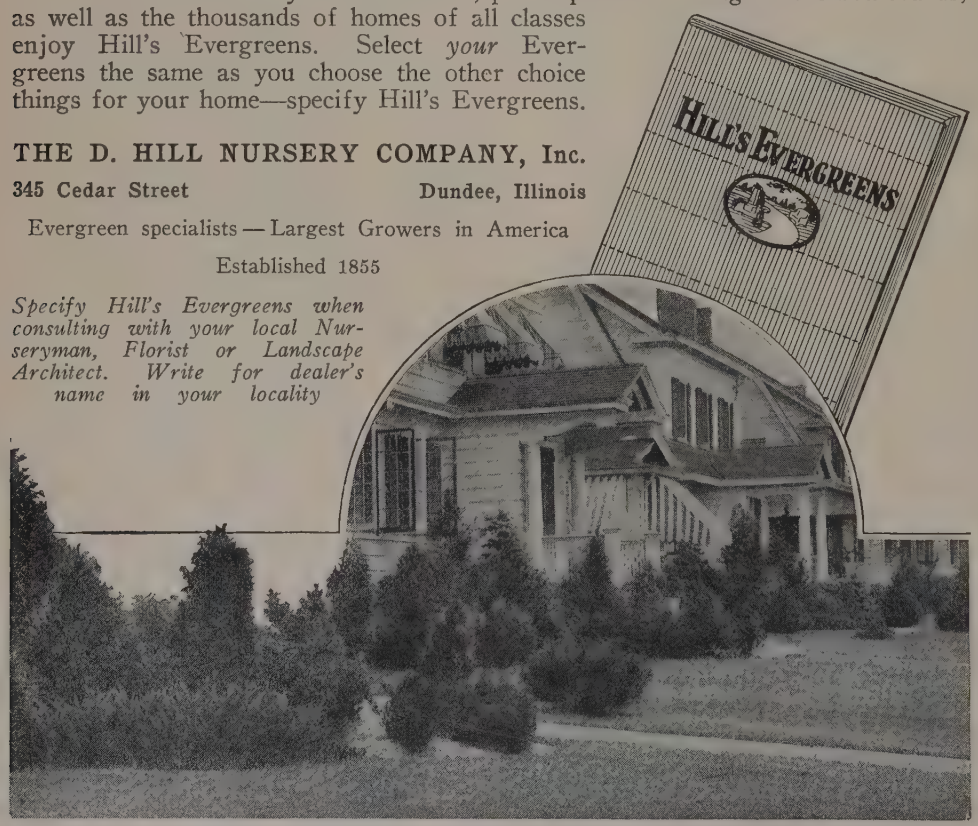



## Brown Bears and Black

The article on the Black Bear, by Dan McCowan, which appeared in our December issue, has brought forth the interesting story of a bear hunt in Montana some years ago. On this occasion a woman in the party shot two brown bears, one of which was a black bear and the other a grizzly. As these were brought into camp at the same time it was possible to examine the skulls side by side and establish the facts beyond any question of doubt. The skulls were subsequently exhibited at Livingston.

## A United Effort to Save the Antelope

At a well-attended conference on December 14th, called by Dr. E. W. Nelson, chief of the United States Biological Survey, it was brought out that there are remaining in the United States only about 23,000 wild antelope.

The most outstanding result of the meeting was a definite plan to establish a federal antelope reservation in southern Oregon. This idea had been brought forward three or four years ago, but had been bitterly opposed by stockmen in that part of the country. The present plan had been advanced by sheep and cattle men living in that section of the country at a meeting held in Lakeview, Oregon, November 15, 1923, and two delegates attended the Washington meeting. These were Dr. J. L. Lyon of Lakeview, and Mr. L. D. Frakes of Warner Lake.

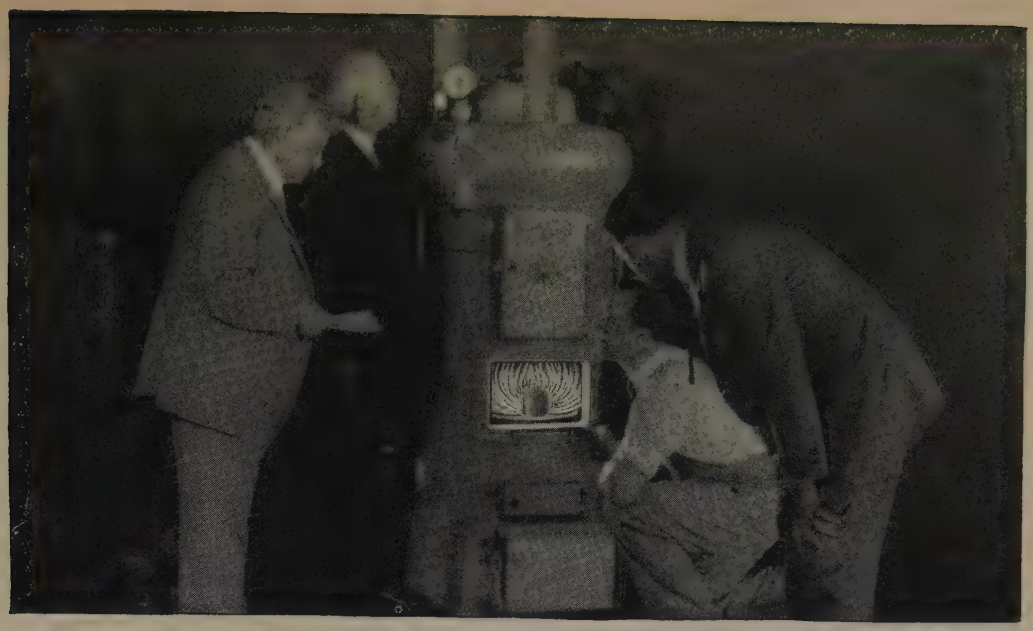
This plan has the backing and support of conservation associations throughout the country, and under the direction of T. Gilbert Pearson, president of the National Association of Audubon Societies, united effort will be made to persuade Congress to officially establish this reservation for the protection of both antelope and sage grouse.

## Where East Meets West

William L. Finley of Oregon, western representative of Nature Magazine and lecturer of the National Association of Audubon Societies, attended the annual conference of the American Game Protective Association in New York City December 10th and 11th.

At one of the afternoon sessions Mr. Finley gave an illustrated talk on the "Destruction of Wild Fowl Refuges," showing great lakes and swamps that had been dried up. At the annual banquet, the evening of December 11, he showed a reel of motion pictures of antelope and sage grouse and made a strong plea to save these two disappearing species.

Mr. Finley is a member of the Advisory Board of the Migratory Bird Treaty Act which met in Washington, D. C., on De-



# How *the* Oliver Engineers Found *a* New Cheap Fuel *for* Your Furnace

"....It burns with an intense blue white flame. After 300 hours continuous burning scarcely a trace of carbon or soot was found—there was no odor detectable, no smoke passing through the flue. Showing a wasteless combination. (See Section XII.) With the flame turned highest we were able to generate over a three hour period a positive increase over the heat of coal, in the same furnace, for the same length of time.

R. REED MORRILL, Supervising Engineer.

IN a way, it is surprising that no one hit upon this new fuel before.

The dirt and drudgery, the extra housework that coal or wood burning brings has surely justified the universal desire to find a cleaner, cheaper and more convenient substitute. And the yearly strikes, the exorbitant prices, shortages and the constantly diminishing supply have been responsible for a concentrated effort to *perfect* new *heating* devices, particularly *automatic oil burners for furnaces.*

It is quite natural that American scientists should turn first to oil, with its plentifulness and low cost. As a matter of fact, the first efforts of the Oliver Engineers was toward the perfecting of a new oil burning device. *But our first experiments proved that if we were going to give to the world a desirable substitute for coal we would have to give up the idea of making simply another oil burner.* If we were to really achieve our purpose of providing an installation so cheap and so simple that anyone could afford and operate it, we *could not* make use of the motors, electricity and complicated machinery formerly thought necessary to oil burners.

## The World's Most Efficient Fuel

Scientists have long known that oil was the cheapest, most concentrated form of combustible carbon in existence. But they did not know how to burn it efficiently without pressure.

The Oliver Engineers found out how to do this—they actually found a way to convert oil into a *fuel gas* composed of only 5 parts oil to 95 parts of air. And, most wonderful of all you can burn this wonderful fuel in your hot air, steam, or hot water furnaces *without a single mechanical device or moving part*—with no noisy motors, no electrical connections, with no pumping of air—and without changing the construction of your present furnace!

## Already in Over 150,000 Homes

At the top of this article I have quoted the last paragraph of the written report of the experiments of the Oliver Engineers—just as it was given to me on the 21st of May 1921, by R. Reed Morrill (said to be one of the three best Combustion Engineers in America). Today, a great 6 floor factory in St. Louis is working day and night to supply the demand for this amazing burner. Already, Oliver burners are in use in over 150,000 homes. Users in Alaska and Northern Canada report most satisfactory results right through the Arctic Winters, when the thermometer registers 40 degrees below zero and even colder.

## Fits Any Furnace

You can be freed forever from the dirt and muss and grime of coal—the ashes to shake, the coal to scoop, the everlasting tending to fires—cold and unevenly heated rooms—the fine dust and soot that filters to every corner of the house and ruins rugs, drapes, and furniture. You can escape the *public burden of supporting coal strikes.* You can have a real automatic Oil-Gas Burner in your furnace at a cost so low that a small part of your coal money will cover it. And this simple device can be installed in your furnace in a few minutes.

You can have instant heat, much or little as needed, by simply turning a valve. Cozy warm rooms in coldest Winter—exactly the heat you need on cool and changeable Fall days. If your present plant has a thermostat, it can be used—or this can be supplied at a slight additional cost.

## Special Low Price Introductory Offer

The Oliver is a perfected burner, the product of 17 years refinement by the oldest and largest manufacturers of oil-gas burners in the world. For a limited time I am making a Special Low Introductory Price to get people in every community acquainted with the Oliver. If you will fill out the attached coupon at once I will send you an interesting booklet Free and full details about this new kind of heat—and automatically your name will be filed with those entitled to our Low Introductory Price, whether you buy now or later.—B. M. OLIVER

## The Oliver Oil-Gas Burner Co.

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Specify Steam, Hot Air or Hot Water

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# Burpee's Seeds Grow

## Burpee's Annual

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FOR 1924 we are offering some of the finest new varieties that have been introduced in recent years. Amongst the Burpee Novelties is our wonderful **New Sweet Pea, The President Harding,** which was named by special permission of the late President of the United States.

In our new catalog we are also offering for the first time the **Philadelphia Bush Lima,** which is the earliest and most prolific of all Lima Beans, and the two **New Sweet Corns, Delicious** and **Sunnybrook,** which are a new development out of our famous Golden Bantam. **New Giant Snapdragons, New Zinnias, New Dahlias, New Gladioli, and a New Self-Pruning Tomato** are some of the new creations which are offered this year exclusively by W. Atlee Burpee Company.

If you are interested in gardening, **Burpee's Annual** will be mailed to you free. Write for your Annual today.

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23

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cember 13th. This is a committee of experts from different parts of the country appointed by the Secretary of Agriculture to consider and recommend any changes in the regulations for the much needed protection of migratory birds.

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## Not Even on the Dollar Bill

Recently Nature Magazine told the story of the destruction of the American eagle by bounty seekers. The public was aroused to a realization that at the present rate of killing the only place that our national bird would be found would be on the dollar. Now the Treasury Department has issued a new series of pretty, green one dollar notes and the poor old eagle does not appear even there.

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## Franconia Notch Threatened

Six thousand acres of land in New Hampshire have been placed on sale—not a necessarily disturbing fact—but these acres include the glorious, stern Old Man of the Mountain, the Flume, Echo Mountain and Profile Lake, as well as nine miles of forest along the Daniel Webster highway. The prospect of the cutting out of the forest on any other than scientific forestry principles threatens the beautiful Franconia Notch.

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# Book Reviews

## The Starry Heavens

"What Mercury lacks in brilliance, the planet Venus, the next in order counting outward from the sun, makes up for," says William Tyler Olcott in "The Book of the Stars for Young People" (G. P. Putnam's Sons). "It is the brighest object in the night sky with the exception of the moon, and consequently easy to identify. Its brilliance is largely due to the fact that it is the nearest planet to us. Venus is so bright that it casts a shadow and can easily be seen at noonday. It is six times as bright as Sirius, the brilliant Dog Star. Venus is 67 million miles from the sun it circles, and is almost the size of the earth, being 7,629 miles in diameter. It is often called our 'Sister Planet.' At its nearest approach to us Venus is 23 million miles away, nearer to us than any other heavenly body save the moon and one asteroid. The planet's year is 225 days, the time it takes to make one complete revolution about the sun. Owing to its dense atmosphere of clouds which we cannot pierce, the length of its day has not been definitely determined. Venus, like Mercury, does not possess a moon, although astronomers have often searched for one."

# The Miracles of Nature Revealed In Print and Picture

Come through the magic portals with us, into the wonderlands of nature! Meet the night-moth, the granny-cat, and the bird that wears a moustache. Here are tales stranger than fiction, more fascinating than any concerning human beings!

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—how to attract birds to your home?
—the only bird that does not care for its young?
—what animal feigns death when an enemy approaches?
—what animal stamps when it is angry, as humans do?
—the bird that pays with its life for its laziness?
—what animal carries its young in its pocket?
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## The Great Lakes

"It is not easy for those who see the Great Lakes as they are today," says John T. Faris in "Seeing the Middle West" (Lippincott), "to picture them as they were 250 years ago, in the days of LaSalle whose eyes saw only a waste of waters and the forbidding forests about them, though his mind pictured the prosperous towns that would fringe the shores and the hundreds of vessels that would ply from port to port when the country should be developed. But it is safe to say the prophet had not the slightest notion that the lake fleet would grow until the new vessels built in a single year would cost tens of millions, that close to one hundred million tons of freight would be carried annually, that in one day there would pass through the locks of a lake canal more than one hundred vessels."

## Petrified Trees

The Petrified Forest in Arizona is one of the great natural wonders of the world. It covers many thousand acres of land and comprises vast deposits of petrified wood, from the smallest fragments to trees more than 200 feet in length, says Vernon Quinn in "Beautiful America" (Stokes).

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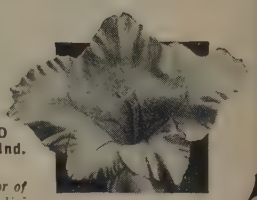

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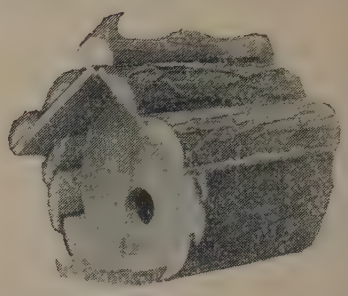

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thousands or millions of years the forest lay buried beneath the sandstone and limestone sediments of the sea and the blanket of volcanic ash. In more centuries, this covering gradually was washed or torn away by floods and storms, by the rush of torrents and the swirling fury of sandstorms; and at some era before the present age the trees again were left bare under the Arizona skies. The trunks are lying prone, and are broken—clean-split as by frost—into many irregular lengths. Seldom is any piece more than twenty feet long, and the average is much less than that.

## Orang-Outan's Walk

"The walk of the orang-outan is little better than an awkward hobble, and the creature shuffles along uneasily by help of its arms," says the Rev. J. G. Wood, M. A., F. L. S., in "The Illustrated Natural History" (E. P. Dutton & Co.). "The hands are placed on the ground, and are used as crutches in aid of the feet, which are often raised entirely from the ground, and the long arms over its head preserves its equilibrium by their means.

"Among the trees the orang-outan is in its element, and traverses the boughs with an ease and freedom that contrasts strongly with its awkward movements when on the ground. It has a curious habit of making for itself a temporary resting-place by weaving together the branches so as to make a rude platform or scaffold on which it reposes. The powerful limbs of the animal enable it to execute this task in a very short time."

## Manual of Entomology

This volume, by H. Maxwell Lefroy (Longmans), is based upon the lectures given as the second of three parts of a course occupying one year of a full training in economic entomology. To compile in book form a complete entomology, apart from description of species, would occupy many years and fill many volumes. In lecturing, one's attempt is to pick out what the student can know—essentials, and not details are the requisite—and this volume attempts to select the usual ordinary facts about each group, which the student requires. The unusual, the "romantic," is cut out; there is no romance of nature, but the solid sober facts of the habits and life-histories, so far as we know them, of the usual insects. While admiring the "romance" of the insect that really does extraordinary things, it is not the basis required by the student of economic entomology, who will presently be dealing with an outbreak of a pest that affects the welfare or lives of many people.

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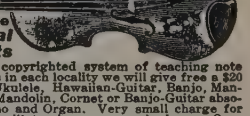

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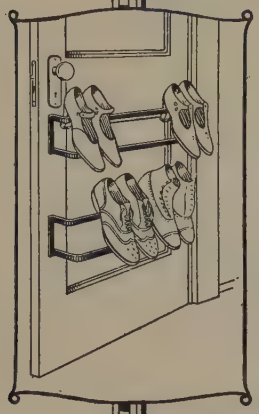

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## Photographing Birds

"The commercial value of a good bird picture may not be worth so much on the market as a mounted bird, or a bird's skin," says A. H. Cordier, M. D., in "Birds, Their Photographs and Home Life," published by Dorrance, "but to the future generation the value of a live bird in the bush is greater than that of two dead ones in the hands of a commercial ornithologist. I am not decrying the works of the museum collectors, but the amateur who has the hobby of collecting bird eggs and skins and selling them, or who goes through life perched on his bird-carcass hobby, deserves all the censure bestowed on him by the conservationists."

## The Dunes of the Lake

"For ages the Chicago dune region, ranging from Waukegan to Michigan City, has been one of the centers of life and activity on the American continent," says George A. Brennan in "The Wonders of the Dunes" (Bobbs Merrill). "Here was everything to attract settlers in primeval, prehistoric days. The many large animals found in the woods bordering the shores of Lake Michigan and the rivers and lakes connected with it; the myriads of fish and water fowl; the great beds of shell-fish; the wild rice everywhere in the inlets, rivers and great marshes—furnished everything that prehistoric dwellers needed for

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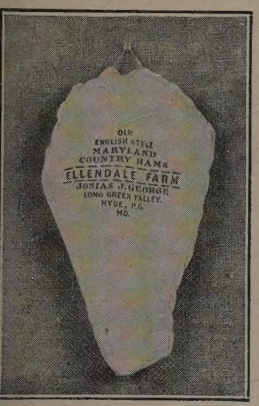


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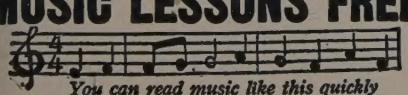
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food, clothing and shelter. According to a scanty tradition these prehistoric people were of a very low type; they may have belonged to the same type as those who have left the great shell mounds along the Atlantic coast and many rivers leading into it. They were probably the ancestors of the Skraellings, or Eskimos. While it is not known definitely who they were, it is believed they were living here at the end of the Glacial Period, and possibly with the ancient lion, tiger, mastodon and mammoth."

## The Mystery of Thoreau

"Henry David Thoreau, foremost among American authors who deal with nature, remains to this day something of a mystery," says Norman Foerster in "Nature in American Literature" (MacMillan). "Although he has had more interpreters than any of our other writers on nature, his complex personality has eluded an ever-gathering host of sentimental disciples, whom he would have been the first to spurn, and nearly all his ingenious critics from Lowell and Stevenson to those of his centenary in 1917. He has been regarded as an American Diogenes and a rural Barnum; as a narrow Puritan, as a rebel against Puritanism, as a German-Puritan romanticist; as a sentimentalist; as a poet-naturalist; as a hermit worshiping nature; as an anarchistic dreamer, as a loafer, as a poser, as a prig and skulker, as a cynic, as a stoic, as an epicurean. Where, amid these bewildering and often equally plausible interpretations, are we to find what he himself called his 'true center,' if indeed he has one? Obviously, the answer should lie within the twenty volumes of his collected writings; in part, however, it should be revealed by an examination of the influences that were most important in making him what he was."


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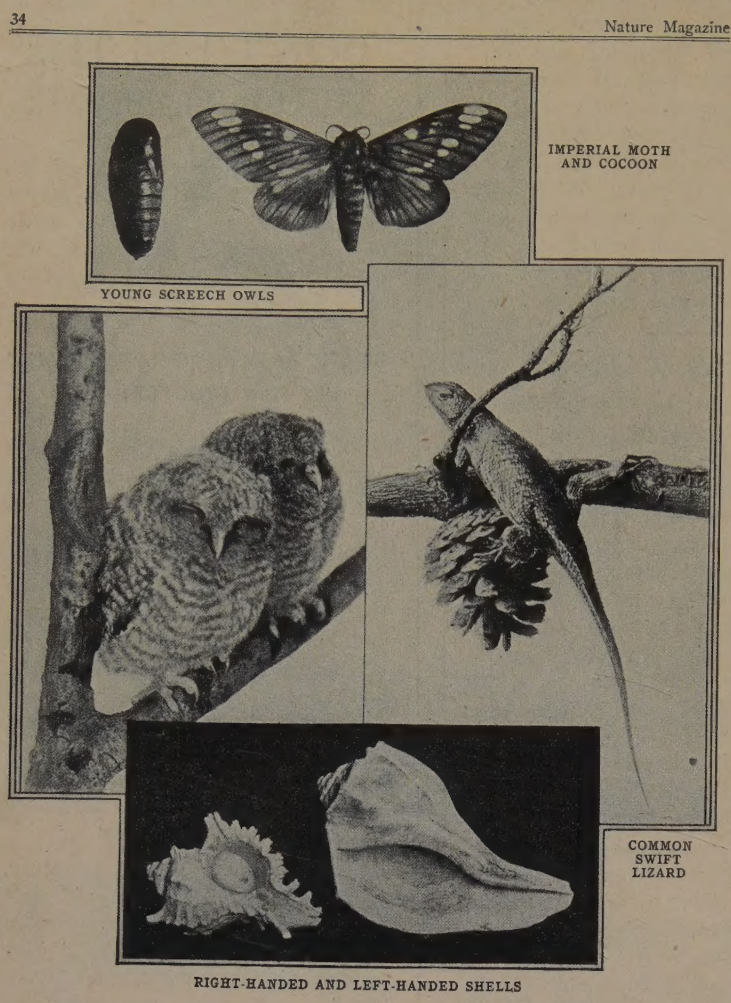

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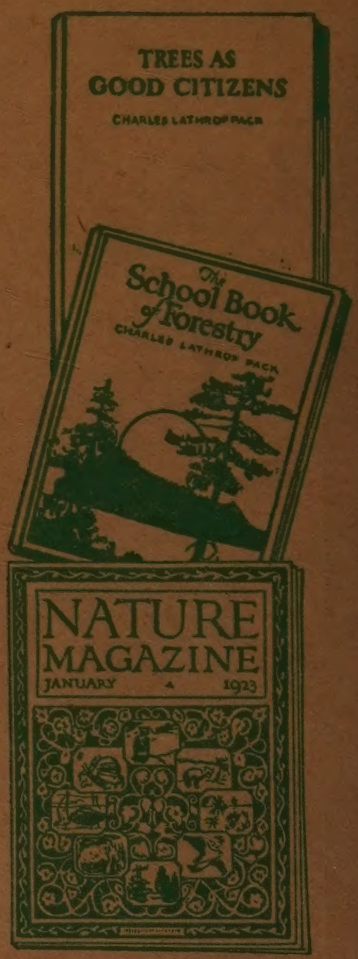


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